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CIRCULATES EVERYWHERE IN CANADA

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

MONTREAL, Eastern Townships Bank Bldg. TORONTO, 143-149 University Ave. WINNIPEG, 511 Union Bank Building. LONDON, ENG., 88 Fleet Street, E C

Vol. VII. Publication Office: Toronto, January, 1911. No. 1

J.B.&S.CO

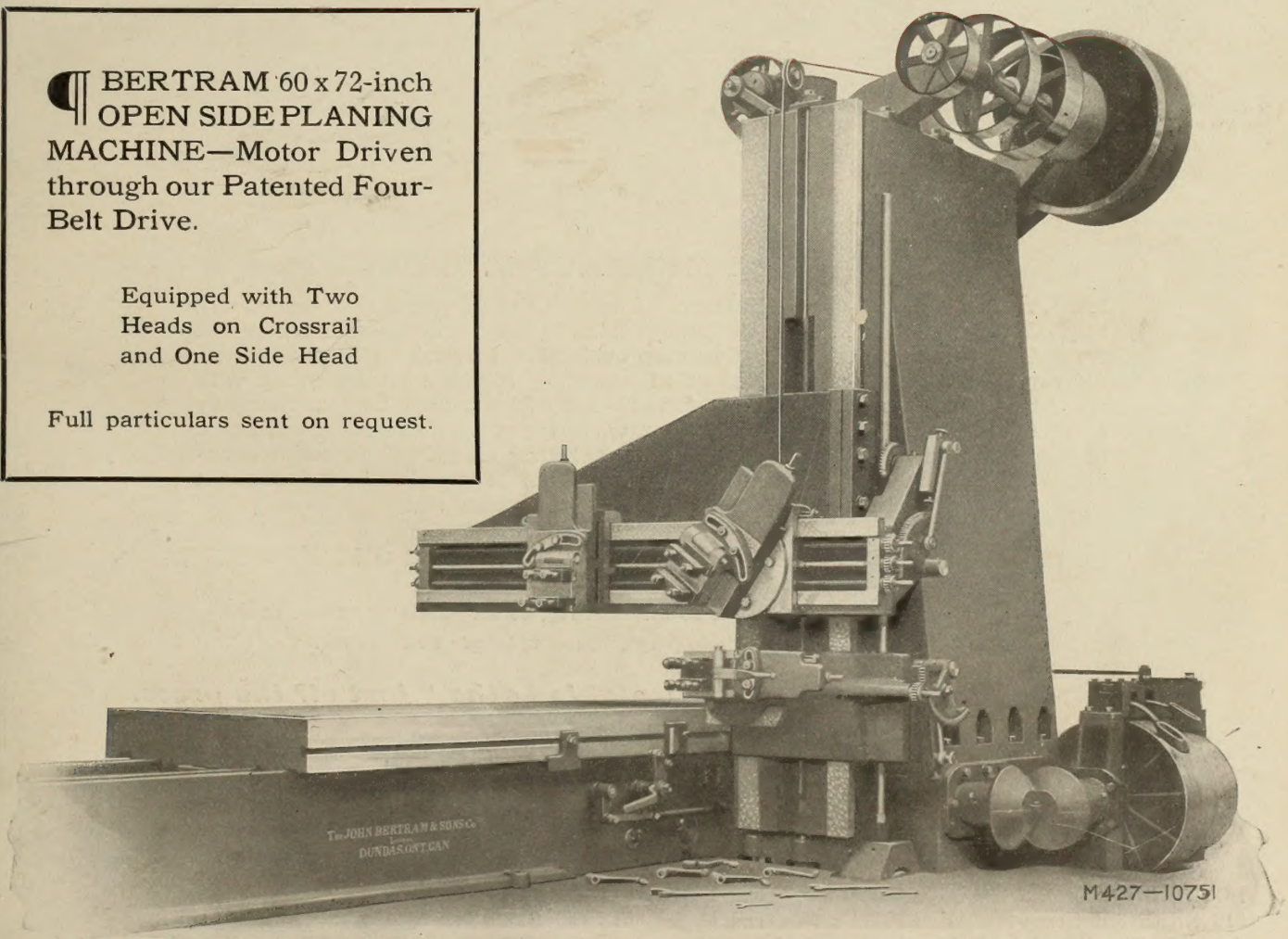
Bertram Planers

J.B.&S.CO

¶ BERTRAM 60 x 72-inch OPEN SIDE PLANING MACHINE—Motor Driven through our Patented Four-Belt Drive.

Equipped with Two Heads on Crossrail and One Side Head

Full particulars sent on request.



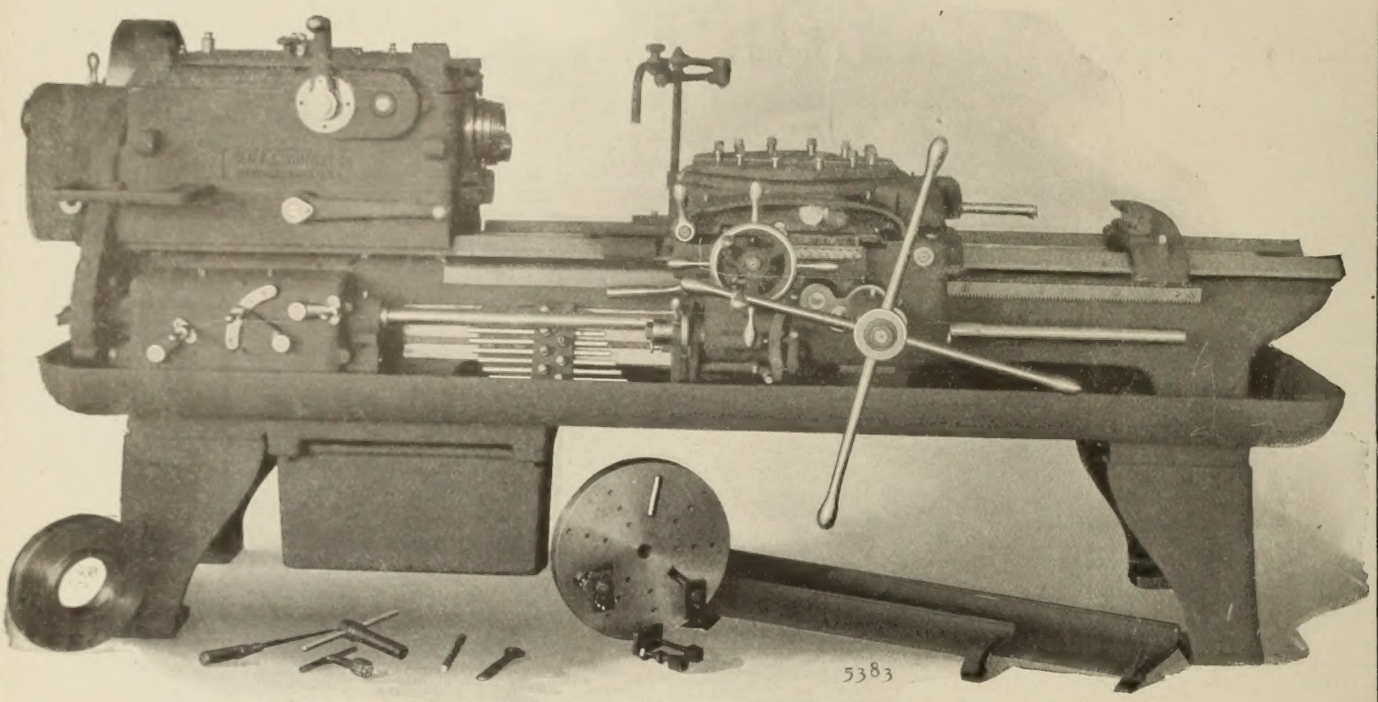
The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO, CANADA

Sales Agents:—The Canadian Fairbanks Co., Ltd. Offices:—Montreal, Toronto, Winnipeg, Vancouver, Saskatoon, Calgary, St. John.

The TURNTABLE LATHE

WITH CROSS-SLIDING TURNTABLE



A MACHINE FOR MANUFACTURING

Hard, rapid, continuous manufacture. It has all the elements that such work requires: Solidly fastened stationary head. Cross-sliding flat, hexagonal turntable. Accurate and positive stop systems. Powerful all-geared drive, delivering the maximum power at all speeds. Massive construction, with weight distributed mathematically correct---fully 30 per cent. heavier than any similar machine. An unyielding and unwavering control combined with ease of manipulation and instant response to operating levers. A degree of accuracy and duplication that do away with all final bench fitting. A tool outfit that is universal in application to meet any manufacturing demands.

The MACHINE EVERY MANUFACTURER NEEDS. THE ONE ***YOU*** NEED.

One size. Bar capacity, 2½ x 26 in. Swing, 20 in. Belt or motor drive.
Equally efficient on forgings, castings or rod work.

Write for new catalog, "The Turntable Lathe," just off the press.

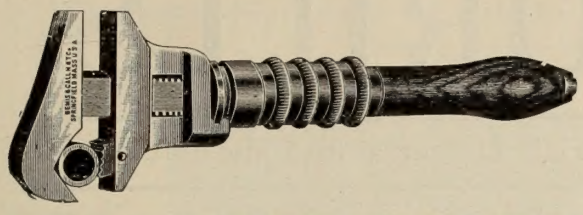
PRATT & WHITNEY

HARTFORD, CONN., U.S.A. DUNDAS, CANADA

OFFICES:

BOSTON: Oliver Bldg. CHICAGO: Commercial National Bank Bldg. PITTSBURG: Frick Bldg. ST. LOUIS: 516 North 3rd St. PHILADELPHIA: 21st and Callowhill Sts. BIRMINGHAM, Ala.: Brown-Marx Bldg.
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A Most Handy Tool!



and one which every mechanic should carry in his kit is the

"B. and C." Combination Wrench

a tool that does duty for two ordinary wrenches.

Of best materials and finish, like all "B & C." tools; head, bar and shank are a one-piece steel forging.

Equally handy for nut or pipe work.

Send TO-DAY for our new complete Tool Catalogue

BEMIS & CALL HARDWARE AND TOOL COMPANY

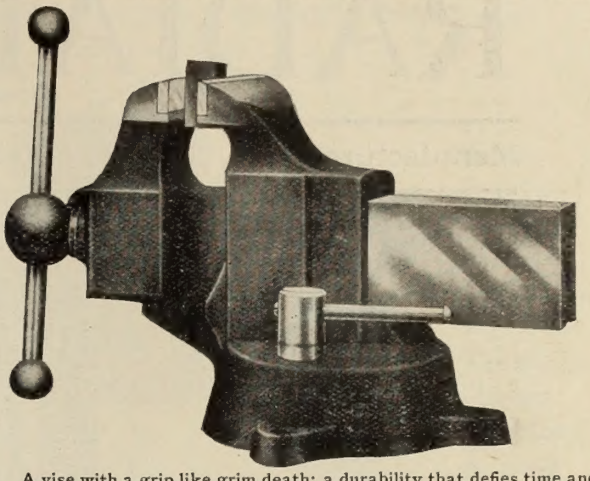
SPRINGFIELD, MASS., U.S.A.

TRADE B&C MARK

TRADE B&C MARK

The YOST

Solid Jaw and Swivel Bottom Machinist's Vise



A vise with a grip like grim death; a durability that defies time and the hardest usage.

A vise that will give you a lifetime of perfect service and satisfaction. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

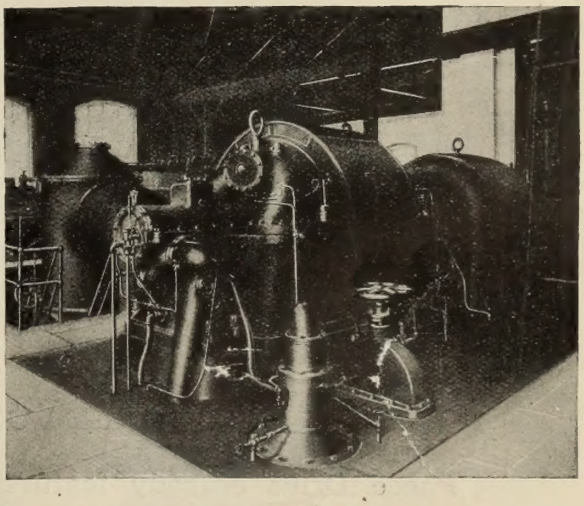
Incomparably Good

The Yost catalog would certainly interest you. Write us, asking for a copy.

CANADIAN YEATES GORDON CO.
HAMILTON - - ONTARIO

This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.

A 500 Kilowatt Westinghouse Exhaust-Steam Turbine, using exhaust steam from a 300 Kilowatt Simple Corliss Engine and a 100 Kilowatt tandem compound automatic engine in a certain small power station, is effecting a saving of 79 tons of coal monthly over previous rates of fuel consumption.



Westinghouse Exhaust-Steam Turbine Installation.

A feature in connection with the starting of this unit, showing its simple mechanical construction, was that the turbine was installed and placed in service by the company's own engineers, who, besides having never operated a Westinghouse Turbine, had never seen one in service, or even dismantled. The machine had operated a month before an erecting engineer reached the plant to make an inspection, which showed the turbine to be in excellent adjustment. Publication 9012 tells about our Exhaust-Steam Turbines.

Canadian Westinghouse Co., Limited

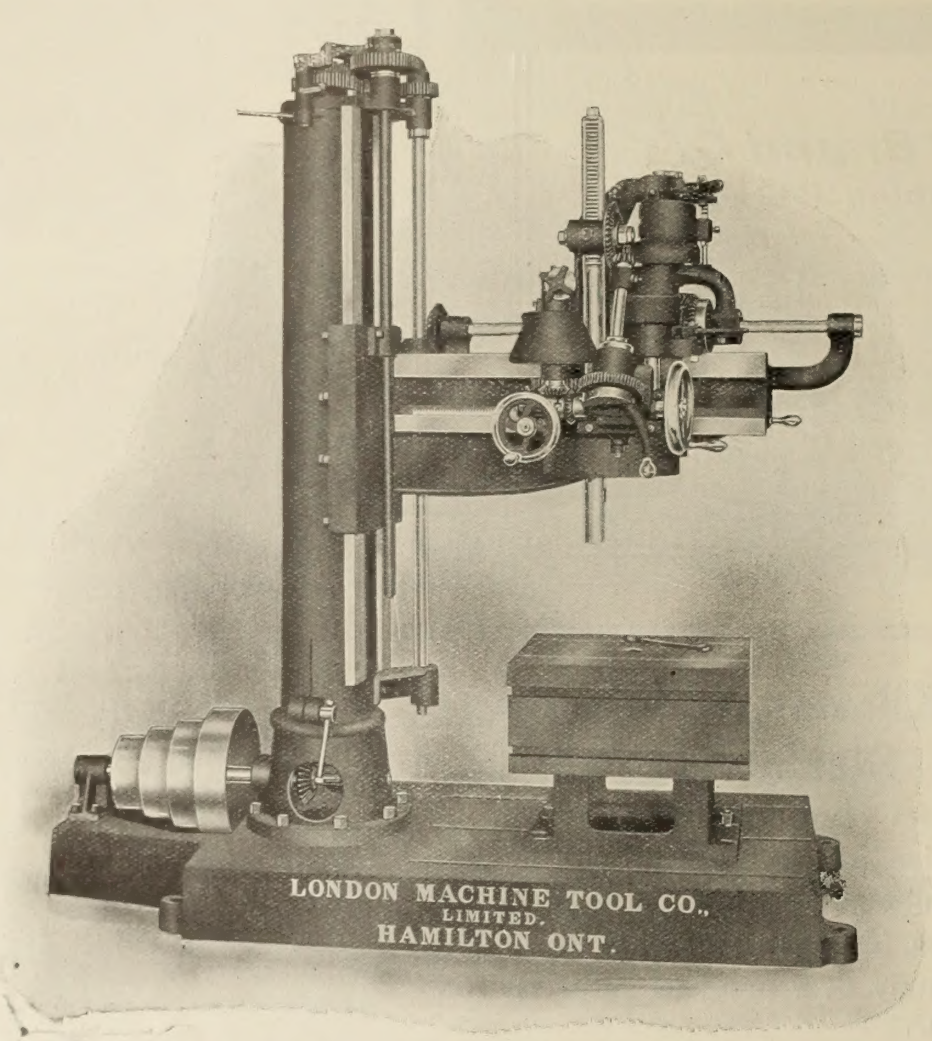
General Office and Works, HAMILTON, ONT.

For Particulars Address Nearest Office

TORONTO	MONTREAL	HALIFAX	WINNIPEG	CALGARY	VANCOUVER
Traders Bank Building	52 Victoria Square	Telephone Bldg.	158 Portage Avenue E.	311 8th Avenue West	439 Pender Street

RADIAL DRILLS

Manufactured in 3, 3 1-2, 4, 5, 6-ft. Size. Plain Universal in 5 and 6-ft. Size



THREE-FOOT PLAIN RADIAL

These Drills embody features which make our Drills unsurpassed for convenience, accuracy, durability, speed.

Write for further particulars

London Machine Tool Co., Limited

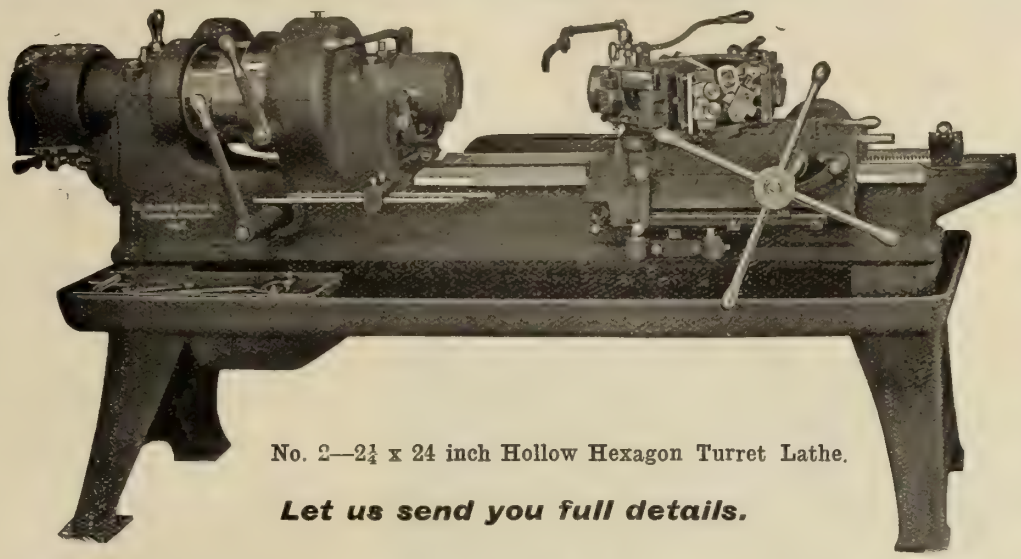
HAMILTON, CANADA

Eastern Agents:—Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que.

TURRET LATHES

They handle heavy work with extreme accuracy and utmost ease. We build them in sizes from 5/8 inch to 3 5/8 inches chuck capacity.

Hollow Hexagon is one of our principal types of Turret Lathes for Bar Stock or Forging work coming within their range.



No. 2—2¼ x 24 inch Hollow Hexagon Turret Lathe.

Let us send you full details.

Hollow Hexagon Turret Lathes are built in sizes from 1½ ins. to 3⅛ ins. diameters, 18 ins. to 36 ins. in lengths.

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO, U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams & Wilson, Montreal

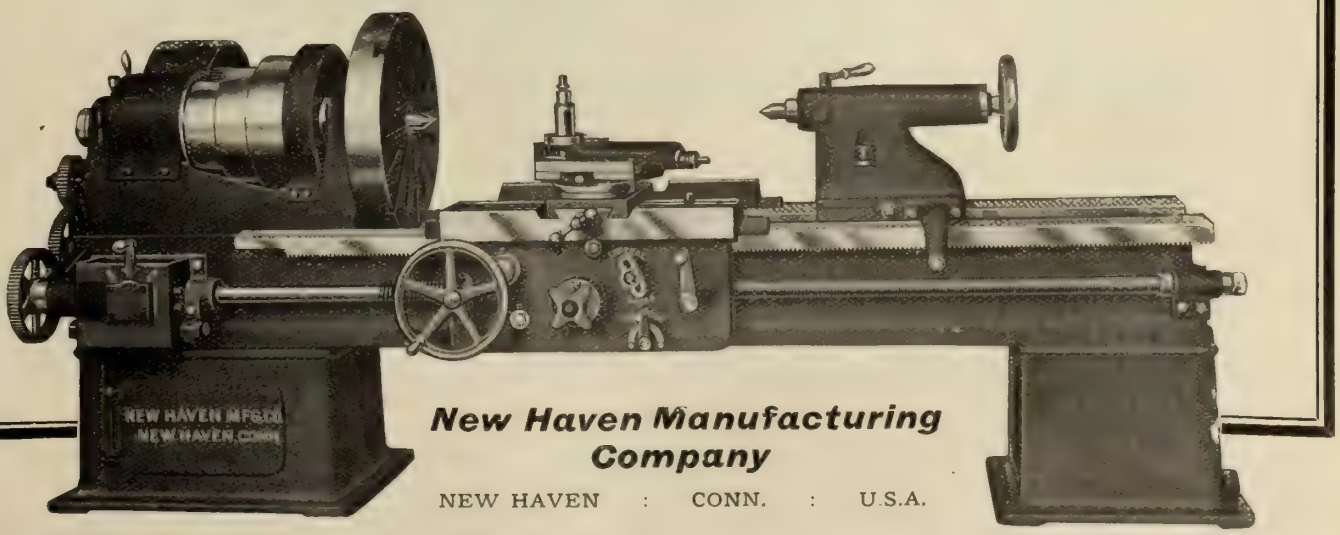
Our 24-inch Swing Standard Lathe!

This is one of the leaders among the celebrated

NEW HAVEN TOOLS

a range noted for their ACCURACY, DURABILITY and RELIABILITY. Every machine is backed by our unconditional guarantee, and is thoroughly tested before it leaves our shops.

WRITE FOR DETAILED SPECIFICATIONS AND ILLUSTRATED CATALOGUE.



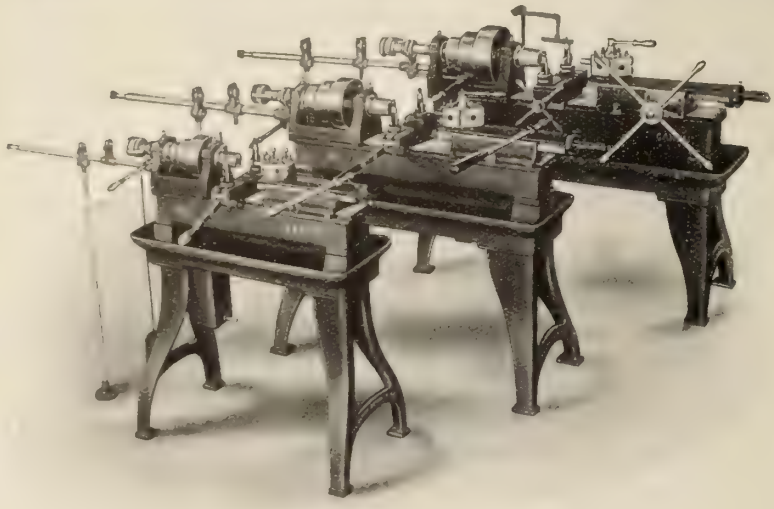
New Haven Manufacturing Company

NEW HAVEN : CONN. : U.S.A.

Garvin Screw Machines

GIVE UNSURPASSED SATISFACTION

The best materials are used in manufacturing these machines. Parts made of Krupp Chrome Nickel Steel, Drop Steel Forgings and Vanadium Steel Springs. Absolutely no steel castings used. Machines can be realigned under all conditions of wear. Spindles are of large diameter, bearings are ground and run in bronze boxes. Cross-slides fitted with plug stops, capable of fine adjustment, and can be lifted from bed without removing turret base. Hexagon Turrets on all machines, except the No. 1. Independent stops to each of the six turret holes. Our turrets and slides have long been renowned for their rigidity without cumbersomeness, the result being large output. The turret momentum is stopped by a solid plug, the lock bolt being used for indexing only. Many other exclusive features.



Garvin Nos. 1, 2 and 2½ Screw Machines, Wire Feed

CAPACITY

				No. 1	No. 2	No. 2½
Greatest diameter	-	-	in.	$\frac{5}{8}$	$1\frac{1}{8}$	$1\frac{7}{16}$
Length of Work	-	-	in.	3	6	$8\frac{1}{2}$
Swing Over Bed	-	-	in.	9	$10\frac{1}{2}$	$14\frac{1}{4}$
Width of Belt	-	-	in.	2	$2\frac{1}{2}$	$3\frac{1}{2}$
Weight, crated	-	-	lbs.	575	1100	1775

IMMEDIATE DELIVERIES

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

Send for Catalog, Edition "E"

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

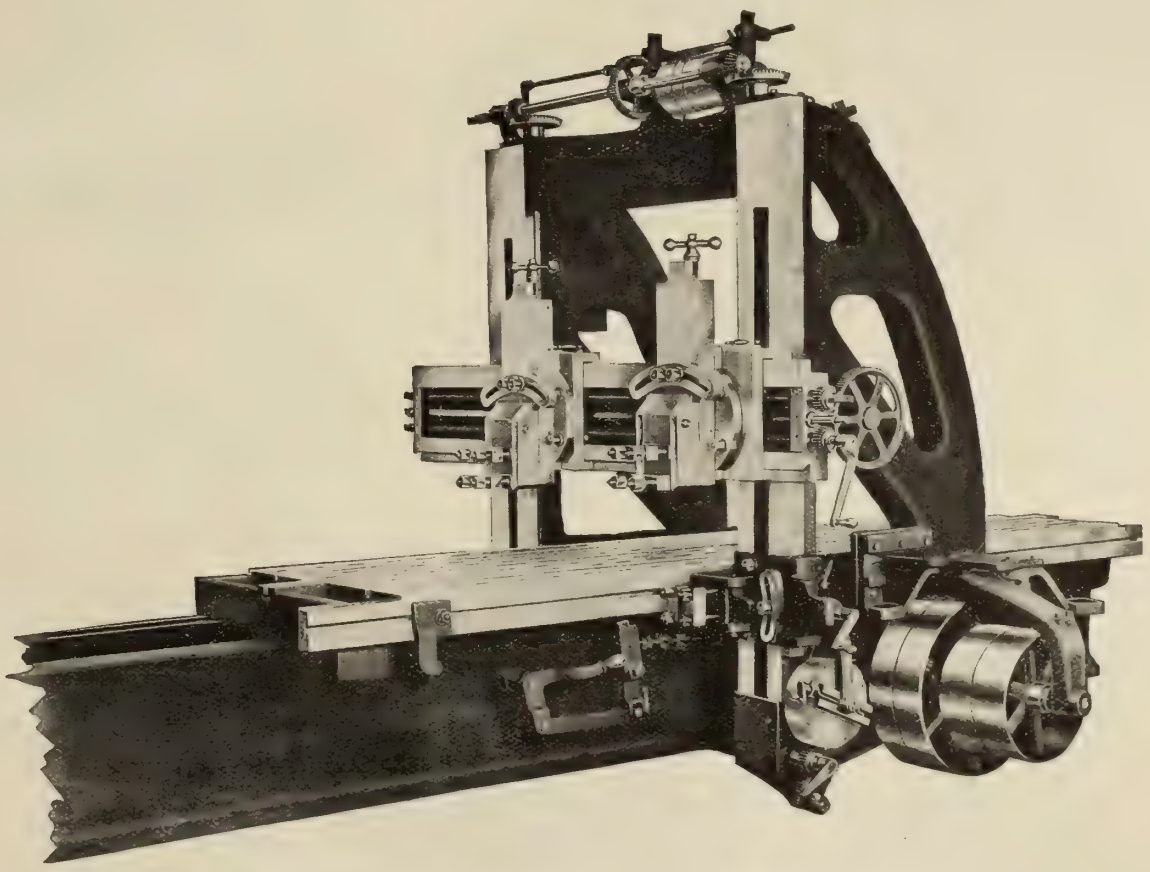
MANUFACTURERS OF

Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Cutter, Tool and Surface Grinders; Die and Screw Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Spring Coiling Machines; Milling Machine and Screw Machine Tools and Attachments; Automobile Machinery and Special Machinery.

Canada Machinery Corporation

PLANERS

Represent the Highest Efficiency

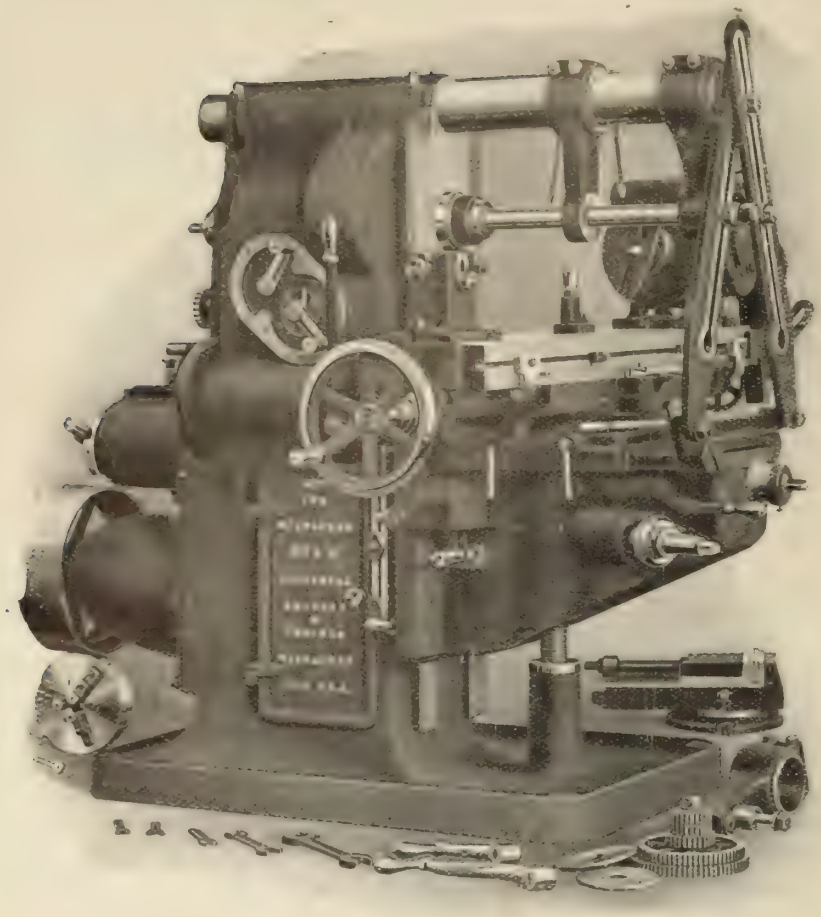


For either HEAVY WORK or LIGHT WORK.
They are RIGID and LASTING, EFFICIENT and POWERFUL.

Let us give you further particulars

Canada Machinery Corporation, Limited

GALT, ONTARIO



THE MILWAUKEE

No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

Let us send you more particulars.

Kearney & Trecker Co.

Manufacturers - Milwaukee, Wis.

Agents:
The A. R. Williams Mach'y Co., Toronto
Williams & Wilson - Montreal

The Modern Internal Grinder, No. 6

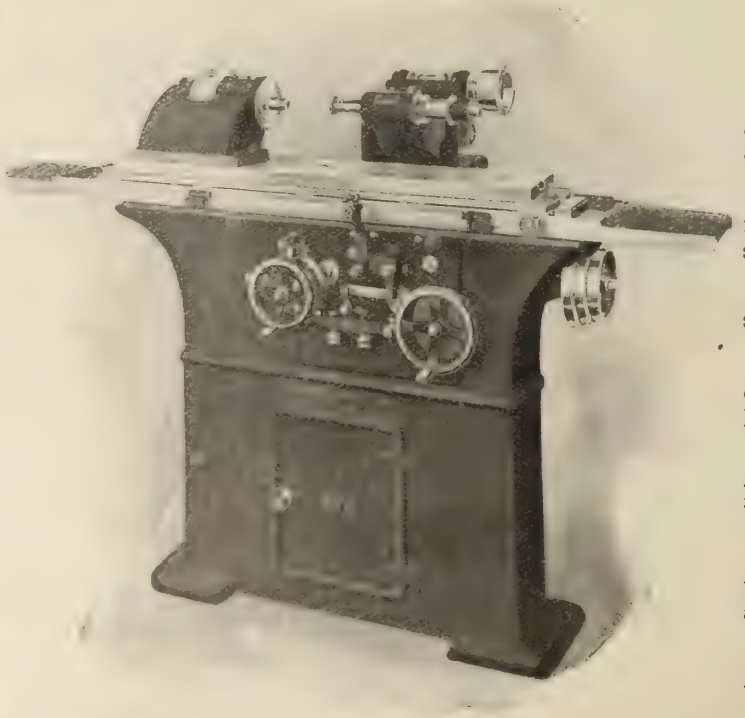
This machine certainly

Does Cut Down the Cost

of internal grinding. It is full universal and, therefore, can do a great variety of work, both straight and taper.

This machine has our improved patented belt-tightening device, which prevents unnecessary strain on wheel spindle.

Give No. 6 a trial. It will prove itself.



CAPACITY AND DIMENSIONS

Will swing 10 in. diameter and grind 10 in. deep.

Extra long spindles may be obtained at small additional cost.

Speed of countershaft, 325 R.P.M.

Speed of wheel spindle, 8,000 to 12,000 R. P.M.

Countershaft driving pulley is 10 in. diameter by 4 in. face.

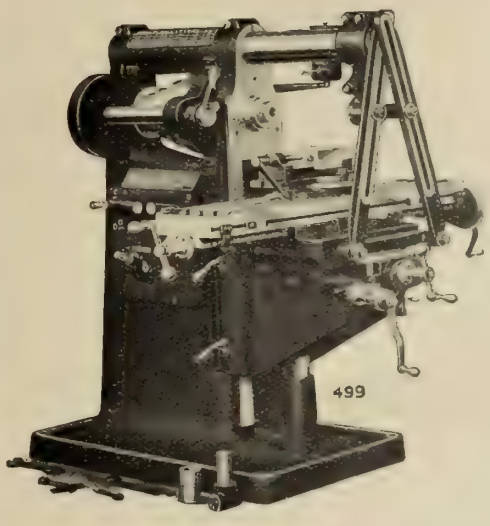
Weight, complete with countershaft, is about 2,200 lbs.

Floor space is about 36 in. by 72 in.

MODERN TOOL CO., Erie, Pa., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

THE No. 2 CONE DRIVEN
CINCINNATI MILLER



OUR CONE TYPE MILLERS have not been forced off the market by Single Pulley Machines. And they will not be. We are making and selling more of them than ever before. We are able to do this because we keep our design ahead of all others.

The illustrations show the No. 2. It has the manufacturer's standard range:—

PLAIN— 28 in. x 8 in. x 19 in.
UNIVERSAL—25 in. x 8 in. x 18 in.

It can be supplied with power feed in one, two or three directions.

We call especial attention to the following features in its design:

The COLUMN is a complete box of rectangular form.

The FEED MECHANISM is a single unit, assembled by men who are specialists on this work.

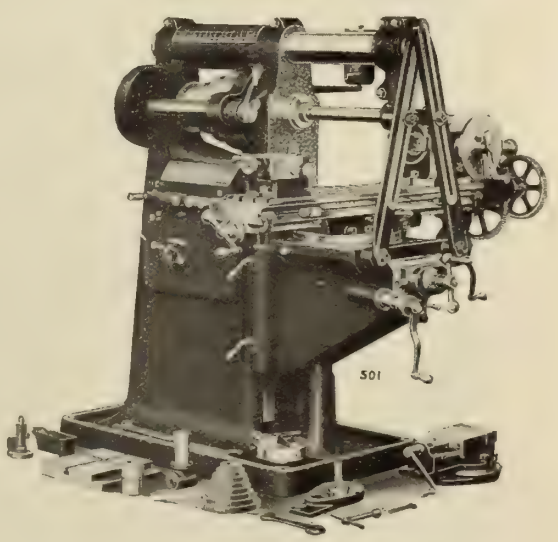
When in place, it is an integral part of the machine.

It is high above the floor. The operator need not stoop to reach the levers.

The feed changes may be made within the practical limits of milling while taking a cut, without inconvenience or injury to the gears, because they are all hardened and run at moderate speeds.

The feed index is direct reading. It is the simplest index used on any machine tool.

All these features make this type the ideal machine for manufacturing small parts and for Tool Room use.



GET OUR COMPLETE CATALOG. ASK FOR PRICES AND DELIVERY.

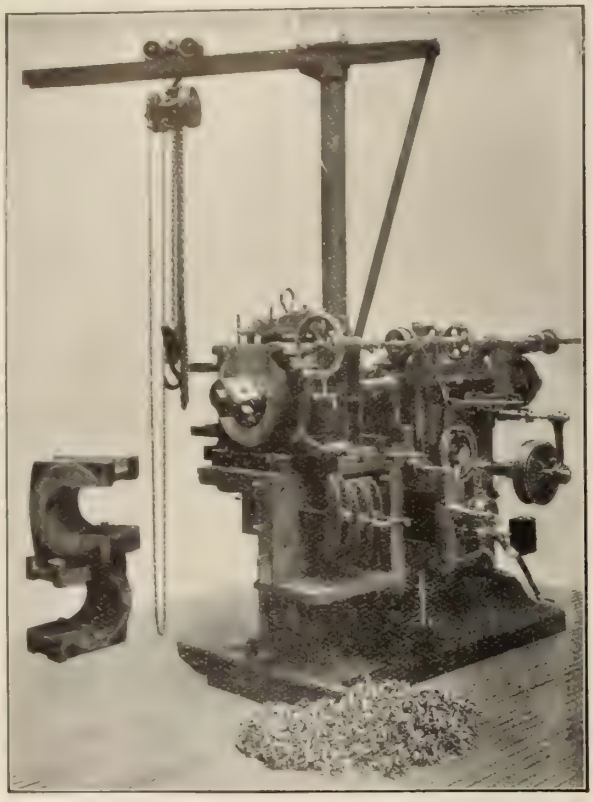
The Cincinnati Milling Machine Company

CINCINNATI, OHIO, U.S.A.

Canadian Agents—H. W. PETRIE, Ltd., Toronto, Montreal and Vancouver.

Don't fail to mention "Canadian Machinery" in writing to advertisers.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

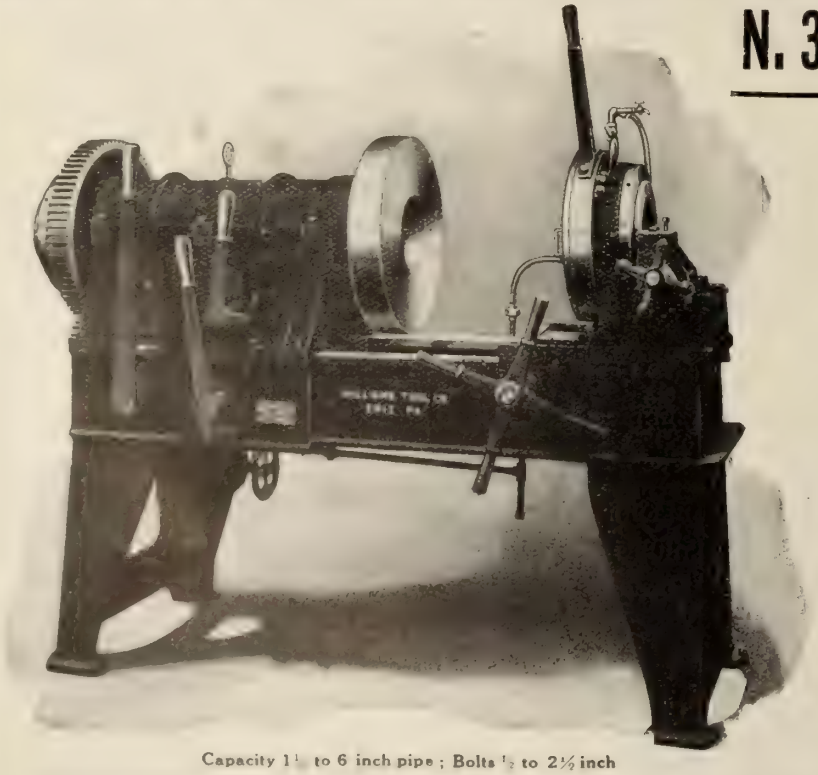
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

N. 3 Williams Pipe Machine



Capacity 1¼ to 6 inch pipe; Bolts ⅛ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼″ to 2″; ½″ to 3″; 1″ to 4″; 1½″ to 6″; 2″ to 8″ and 3½″ to 12″.

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

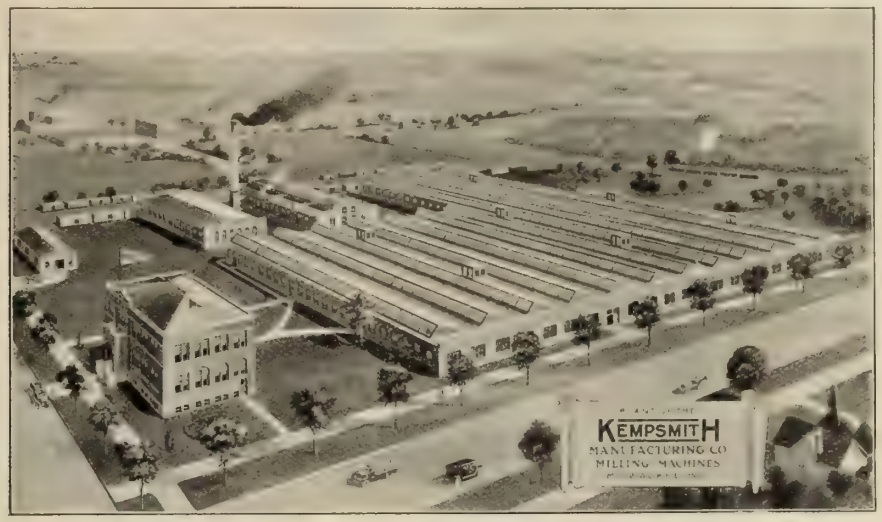
Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.

The Handsome, complete new factory devoted to the



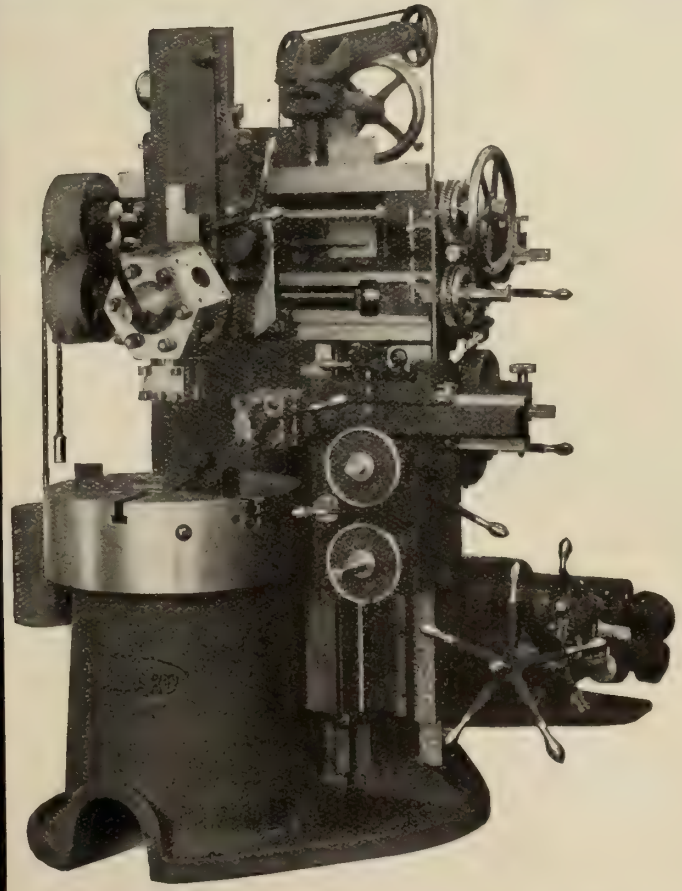
Manufacture of KEMPSMITH MILLING MACHINES

Every detail of system and equipment carefully planned for its function in the production of these machines, and the plant as a whole is truly a model for its purpose. It will mean better product even than before.

THE IDEAL PLANT FOR SPECIALIZED MACHINE MANUFACTURE

The KEMPSMITH MFG. COMPANY, Milwaukee, Wis.

Canadian Agents: Rudel-Yeates Machinery Co., Montreal



THE MODERN DESCENDANT OF TWO GOOD MACHINES

The Vertical Turret Lathe is the latest machine for *multiplied* saving and output.

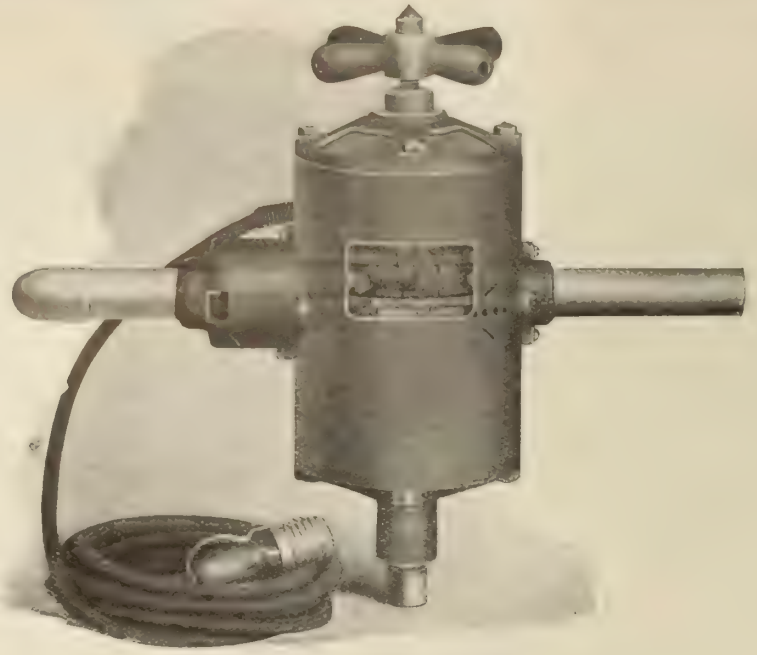
It combines the good features of the **Horizontal Turret Lathe** and the **Vertical Boring Mill.**

By vertical construction, chucking is made easy, and with both a main and a side head, the holding in instant readiness of a complete setting of tools is possible.

Write for new treatise on Face Plate Work No. C15.

It's free—it shows how to "cut costs by cutting time between cuts."

The Bullard Machine Tool Co.
Bridgeport, Conn., U.S.A.



Type "D."

"Hard Service"

Electrically Operated

Drills & Reamers

Built in 6 sizes. Scope 0-2 inches. Increase your output and decrease your factory cost. This means more business and larger profits.

You can do it by using "HARD SERVICE" Portable Drills and Reamers.

These are your ultimate tools if you desire maximum production at minimum cost.

Further information upon application.

Write for Bulletin No. 20.

The Van Dorn & Dutton Company,

CLEVELAND

Canadian Representative: R. E. T. PRINGLE, Eastern Townships Bank Building, Montreal, Quebec.

Like the cut in this ad., The Little Giant stands alone in its field as the leader in design, material, efficiency and durability.



Little Giant Air Drill

The Holden Company, Limited

MONTREAL
354 St. James Street

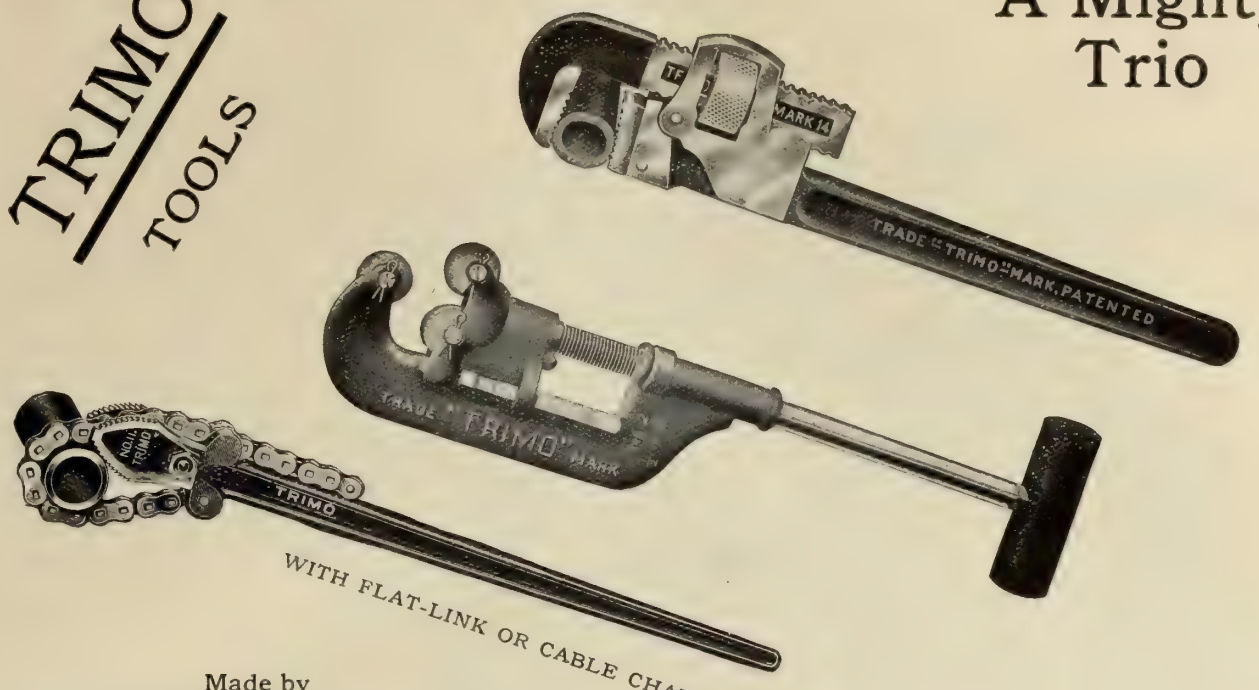
TORONTO
42 York Street

WINNIPEG
291½ Portage Ave.

The advertiser would like to know where you saw his advertisement—tell him.

TRIMO TOOLS

A Mighty Trio



WITH FLAT-LINK OR CABLE CHAIN

Made by

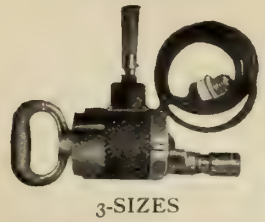
Trimont Mfg. Co.

Roxbury, Mass.

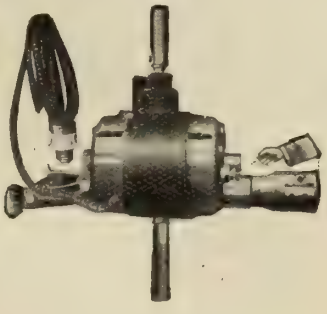
Send for Catalog No. 200

U. S. Electric Drills and Grinders

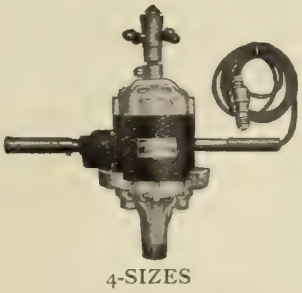
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



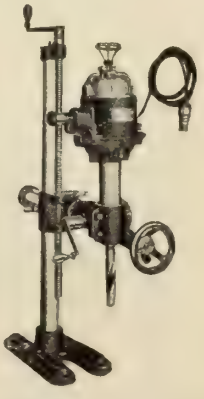
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - OHIO, U.S.A.

A Splendid Tool for the Pattern Shop

Over 1,000 now in use—two-thirds of them were sold to Pattern Shops



No 254 Bench Hand Planer.

This machine is designed especially for the Pattern Shop. It accomplishes perfectly any work to which it may be applied in the Pattern Shop, such as Plane, surface, straight or tapering, joint, edge, etc.

Our No. 254 Bench Hand Planer

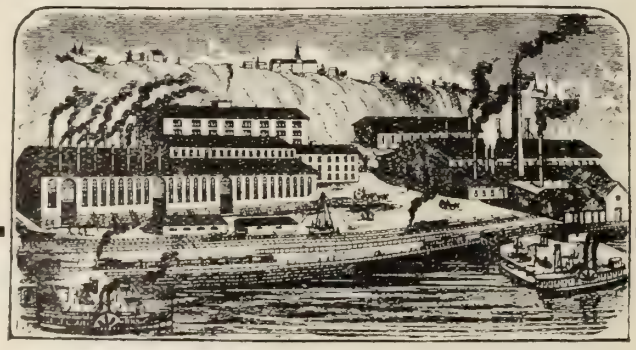
is not expensive — the price is within the reach of all—the Pattern Maker cannot afford to be without it.

WRITE FOR LARGE ILLUSTRATED CIRCULAR

J. A. Fay & Egan Co.

362-382 West Front Street
CINCINNATI, OHIO

MARINE ENGINES and PUMPS. SHOE MACHINERY A Specialty



BRASS and IRON CASTINGS. BOILERS and REPAIRS.

That we have exceptional facilities at our disposal for the manufacture of all kinds of Machinery —in addition to our business as Brass and Iron Founders, General Contractors and Shoe Machinery Engineers—has been amply proved this year. In the short space of five months, we built and installed all the Engines and Boilers of the new sister steamers "Levis" and "Lauzon," whose trial trips were a complete success. We make a specialty of all kinds of Marine Engine Work, and shall be glad to quote for first-rate products only.

SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

Wire of every description for Slugger and Standard Screw Machines.

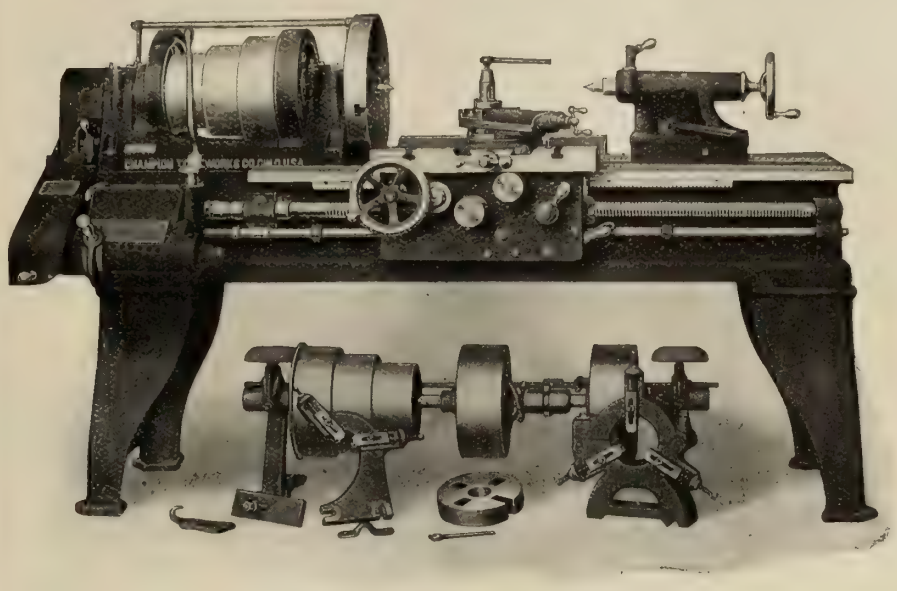
The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director

LEVIS, Quebec

The advertiser would like to know where you saw his advertisement—tell him.

As a Matter of Economy, Can You



16" Quick Change and Double Back Gear Lathe

Afford to buy or use Lathes of obsolete pattern, when at little or no greater cost you can put into your shops such tools as the **"CHAMPION"?**

Our Patented Double Back Gear Control is one of the many really modern conveniences attracting the attention of shop economists everywhere.

Why change from low to high-gear or vice versa by the old, slow and laborious way of moving the gears by hand, when, on the **"CHAMPION"** the operator makes the change instantly by the "Lever" on the front of Headstock without leaving his working position in front of the Lathe?

This and many other important features will be found in our **Catalogue of 10-12-14-16** and **18-inch Lathes.**

WRITE FOR THE "QUICKER AND BETTER WAY."

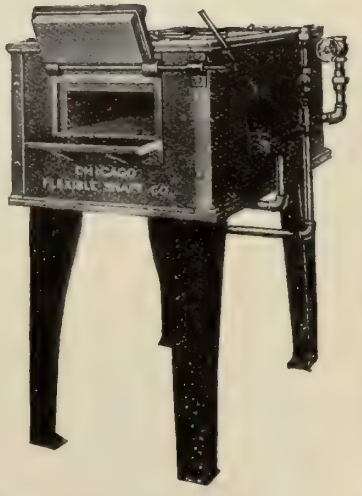
CHAMPION TOOL WORKS COMPANY

Station B CINCINNATI, OHIO, U.S.A.

A Practical Furnace for Case Hardening

THE STEWART NO. 1

Case Hardening and Annealing furnace has proved its worth



It gives uniform results because designed and constructed particularly for the purpose. This feature is absolutely necessary to successful case hardening of machinery steel parts.

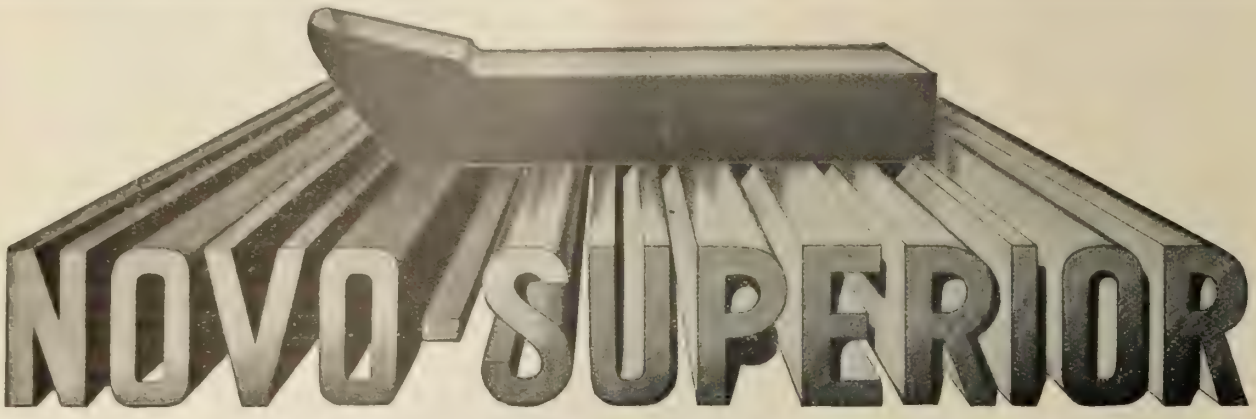
The STEWART has extra heavy linings and heavy clay faced doors. There are many other exclusive features which you ought to be posted on. Send for large furnace catalog which gives complete specifications of this furnace and the entire STEWART line.

Chicago Flexible Shaft Co.

144 La Salle Avenue,

Chicago STEWART

Foreign Representatives: Chicago Flexible Shaft Co., 11 Denmark St., Charing Cross Road, London, W.C. Fenwick Freres & Co., 8 rue de Rocroy, Paris



High Speed Steel Has a Solid Foundation In a Name That Means Something

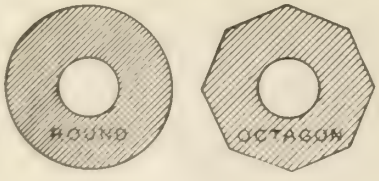
Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

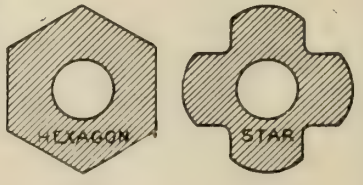
SEND US A TRIAL ORDER AND CONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL

Specify Distinctly  Allen's Stag Brand



Hollow Mining Drill Steels



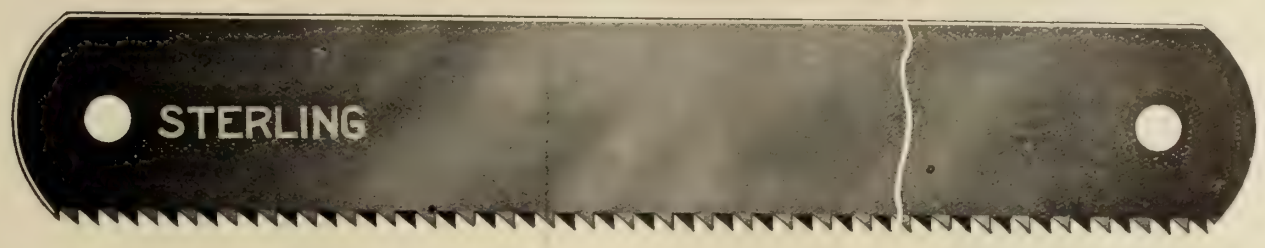
All Sizes and Sections from Stock

SOLE MAKERS AND SELLERS

EDGAR ALLEN & CO., Limited
330 St. James Street - - - Montreal

443

Don't fail to mention adian Machinery" in writing to advertisers.





"Sterling" Hack Saw Blades

It is the universal custom at the beginning of the year to make new resolutions. This applies to business as well as social life. With the ormer we wish to deal.
f

It is the study of every manufacturer to devise ways and means by which to cut expenses. One large item of expense in the manufacture of many products is a Hack Saw Blade. Those who in the past have been using "STERLING" will look no further to effect economy in this direction, but for those who up to the beginning of the new year have not been users of the "STERLING" we would strongly recommend, as one of their business resolutions, to place a trial order for a Blade which, for many years, has been tried and not found wanting.

The remarkable success attained by the "STERLING" Blade is in a large measure due to the fact that the mill from which steel is procured that goes into its manufacture has a reputation second to none, and for uniformity of its product superior to any.

Added to the above fact, careful workmanship, particularly in the hardening process, prove by the most thorough and exhaustive tests that the "STERLING" has no equal and is in a class by itself.

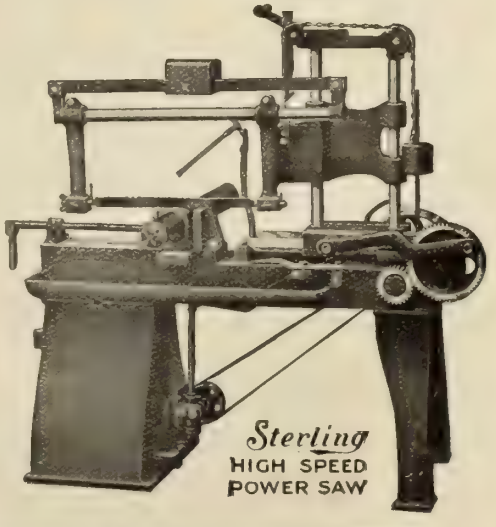
"STERLING" Power Hack Saw Machines

These machines are known the world over for their efficiency and economy.

The Nos. 1 and 2 Machines are used for cutting small and medium size work.

The No. 3 Machine is designed to cut any size work up to and including 8 in. round or 8x12 in., and it is without question the most economical, fastest cutting and up-to-date Hack Saw Machine on the market.

When looking for a Hack Saw Machine, you can make no mistake in ordering a "STERLING."

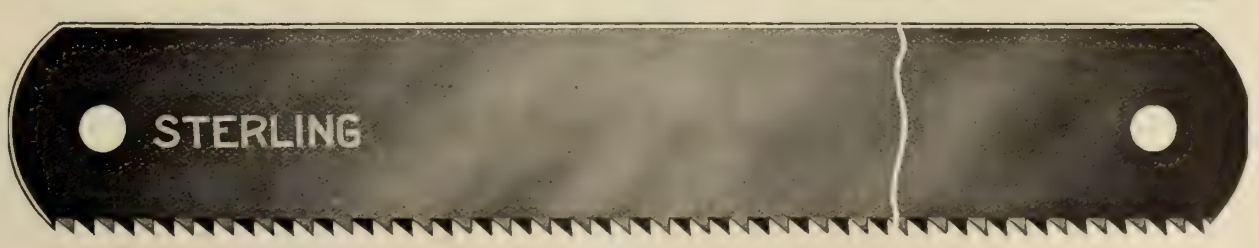


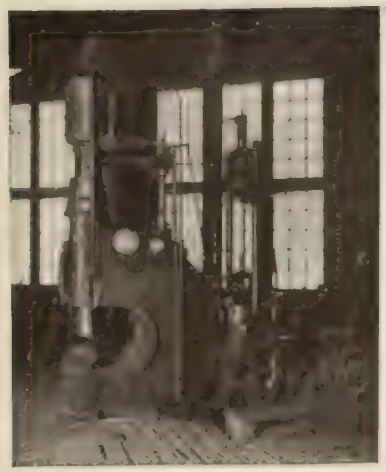
MANUFACTURED BY

Diamond Saw and Stamping Works

BUFFALO, N.Y., U.S.A.

Handled by First Class Jobbers





High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.
2305 Farmers Bank Building, PITTSBURG, PA
EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO.
Manufactured under Davy Bros., Ltd., Patents.

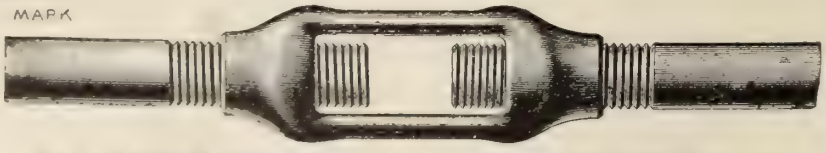
DIE BLOCKS

CRUCIBLE OR OPEN
HEARTH STEEL

Canada Forge Co., Limited, : Welland, Ontario

Drop Forged Turnbuckles

TRADE MARK



ALL KINDS OF SPECIAL DROP FORGINGS
Send Models or Blue Prints for Estimates.

Machine Wrenches
Screw Drivers
Pliers
Structural Wrenches
Track "
Eye Bolts
Lathe Dogs
Etc.



Canadian Billings & Spencer, Limited **Welland, Ont.**

Drop-Forged Steel Throughout

"KEYSTONE"



Made in 3 sizes

Strongest Wrenches Made.

Send for Catalogue.

"WESTCOTT"



Made in 4 sizes.

THE KEYSTONE MANUFACTURING CO.
BUFFALO, N.Y., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

GARVIN CIRCULARS

Frequent changes necessitate issuing circulars to keep our printed matter up to date. The following list illustrates and describes the latest improvements in the various machines mentioned, and any circular you may be interested in, will be sent to you upon request.

Circular No.	Machines
100	Die Slotting Machine.
102	No. 3 Universal Cutter Grinder.
104	Double-Geared Dividing Head.
118	Grinders (Cutter and Surface).
119	Stop and Open Chucks.
121	Cam Cutter.
128	No. 1½ Universal Milling Machine.
129	Automatic Chucks.
130	Nos. 13 and 13½ Plain Milling Machines.
133	Automatic Chucks.
*134	No. 2 Mfg. Universal Milling Machine.
135	No. 2-A Universal Milling Machine.
136	No. 15 Plain Milling Machine, 60-in. Feed.
137	No. 14 Mfg. Plain Milling Machines.
138	Automatic Tappers.
*139	No. 22 Vertical Milling Machine.
140	Rapid Screw Slotter.
142	Nos. 14 and 15 Vertical Spindle Milling Machines.
143	No. 3 Duplex Milling Machine.
144	Duplex Drill Lathes.
150	Nos. 11 and 12 Plain Milling Machines.
152	No. 2 Hole Grinding Machine.
153	Nos. 21 and 22 Plain Milling Machines.
154	Nos. 1, 2 and 3 Hand Milling Machines.
155	Thread Milling Attachment.

* In Press

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

THE GARVIN MACHINE COMPANY

A CORDIAL INVITATION IS EXTENDED TO CALL AND INSPECT OUR WORKS.

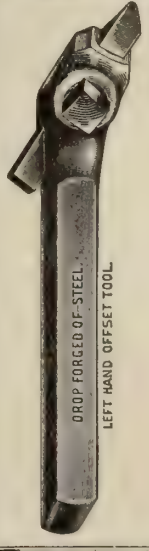
269 Spring Streets 45 YEARS IN NEW YORK CITY

MANUFACTURERS OF

Universal, Plain, Vertical, Lincoln Duplex, Vertical Spindle, Profile and Hand Milling Machines; Die-Slotting Machines, Universal Cutter and Tool Grinders; Horizontal, Vertical and Automatic Tapping Machines; Duplex Drill Lathes; Gang Drills; Screw Machines; Monitor Lathes; Chucking Lathes; Forming and Screw Head Shaving Machines; Spring Coiling Machines; Screw Slotters; Hand Lathes; Tap and Reamer Fluting Machines; Special Automobile Machinery; Special Machines, Tools and Attachments.

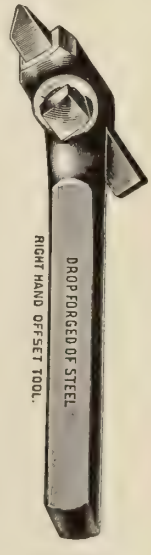
ARMSTRONG TOOL HOLDERS

Adopted by United States Government Arsenals and by the United States Navy, both afloat and ashore









NOTE extra large tool steel set screw and REINFORCED support under the cutter.

THEY GIVE INCREASED CAPACITY AND LASTING QUALITY



Patented
May 12, 1895
May 28, 1901



SAVE ALL FORGING, 70% GRINDING, and 90% TOOL STEEL.

WE MAKE A COMPLETE LINE OF RATCHET DRILLS.

WRITE FOR SPECIAL CIRCULAR AND PRICES



Do you want our new Catalog?
It's a Tool Holder Encyclopedia.

Armstrong Bros. Tool Co.

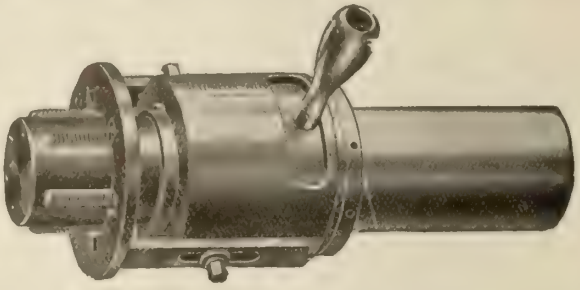
"THE TOOL HOLDER PEOPLE."

106 N. Francisco Avenue, CHICAGO, U.S.A.

There are several tapping operations which you are now doing with solid taps on your Drill Press or Turret Lathe which

Geometric Collapsing Taps

WOULD DO THE WORK BETTER, AND IN HALF THE TIME.



GEOMETRIC COLLAPSING TAPS are as rigid as solid taps while cutting, but collapse their chasers automatically at the end of the cut, and there's no reversing required to back them out. We will be glad to tell you more about them if you will tell us your requirements.

The Geometric Tool Company

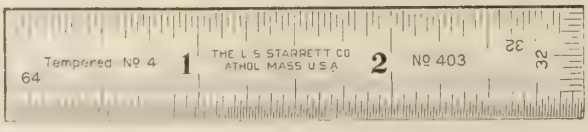
New Haven, Conn., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Quebec; A. R. Williams Machinery Co., Totonto, Ont.

STARRETT TOOLS

ARE THE STANDARD FOR ACCURACY, WORKMANSHIP, DESIGN AND FINISH

THE ACME OF RULE PERFECTION



Spring Tempered Rules with heavy figures, graduated end and beveled edge. Made in 2, 3, 4, 6, 9, 12, 18 and 24-in sizes.

No. 403. No. 4 grad., with 64th's on the beveled edge, and graduated in 32nd's on opposite sides of one end.

No 404. No. 4 grad., with 64th's on the beveled edge, and graduated in 32nd's on one side and 48th's on the other side of the same end.

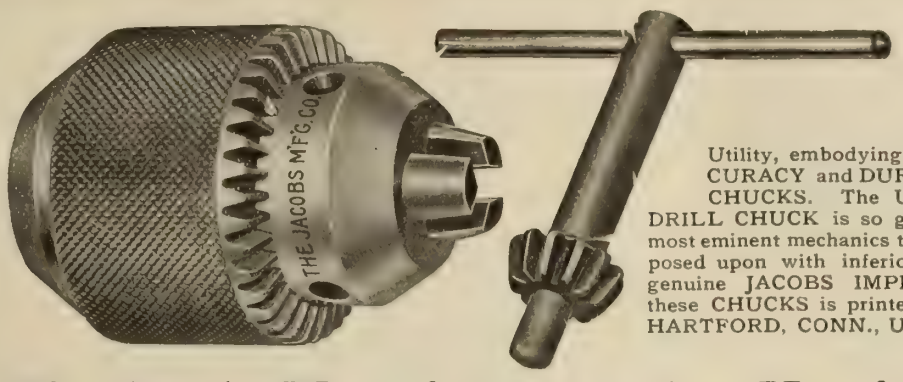
These rules are the most advanced product of the rule maker's art. They are sold at the same price as ordinary spring tempered rules.

Send for Free Catalogue, No. 173, of Fine Mechanical Tools

THE L. S. STARRETT CO.

ATHOL, MASS., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.



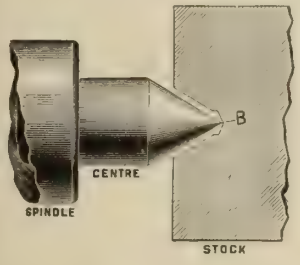
Utility

Utility, embodying CONVENIENCE, EFFICIENCY, ACCURACY and DURABILITY, is our proposition on DRILL CHUCKS. The UTILITY of the JACOBS IMPROVED DRILL CHUCK is so great and universally recognized by the most eminent mechanics that its utility is established. Don't be imposed upon with inferior imitations. Insist upon having the genuine JACOBS IMPROVED DRILL CHUCK. On each of these CHUCKS is printed: "THE JACOBS MFG. CO.,— HARTFORD, CONN., U.S.A.— PATENTED SEPT. 16, 1902."

The Jacobs Manufacturing Co., Hartford, Conn., U.S.A.

"SLOCOMB"

COMBINATION CENTRE DRILLS AND COUNTERSINKS not only save a great deal of time in centreing lathe work, but their first cost is less than any other tools made for this purpose. Slocomb Drills are made of a superior steel, giving great strength and endurance. Besides the saving in time, the use of these Drills ensures proper clearance and correct angles.



WRITE FOR THE COMPLETE SLOCOMB CATALOG.

J. T. SLOCOMB CO., Providence, R.I., U.S.A.

Canadian Agents:

Wood, Vallance Co., Toronto and Hamilton.
Aikenhead Hardware Co., Toronto.
Foss & Fuller, Montreal.



Easy to Adjust



Grips Like Grim Death

The Russell Anti-friction Drill Chuck

is a time and money saver that should find a place in every up-to-date shop.

It is instantly adjusted or released without key, spanner or wrench, and is entirely automatic in its action. Friction is practically eliminated by ball bearings. The "Russell" is the only chuck that will hold straight-shank drills without slipping. Made in 5 sizes. Write for details and prices.

Write for Catalogue.

Distributing Agents for Canada
The General Supply Company of Canada, Limited
Ottawa, - - Canada

Made only by
The Russell Anti-Friction Drill Chuck Co., Elmira, N.Y.

PERFECT IN

Design, Construction and Finish

If you are requiring speed lathes, defer your purchase until you have examined our range of

Grinding Polishing and Buffing Machinery

They are guaranteed to give consistently satisfactory service.

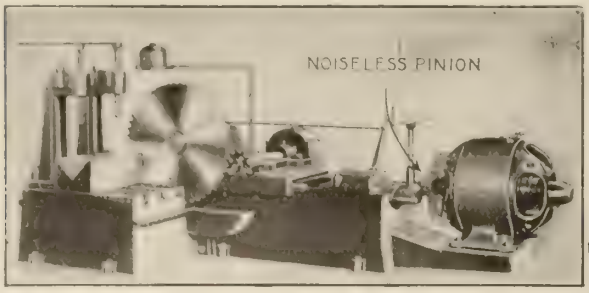


Send for catalogue descriptive of full range of lathes we make.

J. G. BLOUNT COMPANY

EVERETT, MASS., U.S.A.

Don't fail to mention "Canadian Machinery" in writing to advertisers.



That New Process Pinions are *noiseless* is easily verified by asking any one who has seen them work.

That New Process Pinions are ***durable*** is equally well proven through their constant use year after year on the best American machine tools and motors. Men who have the reputation of their product at stake specify New Process in preference to other rawhide pinions because they know that our patented curing process makes the rawhide which wears like metal, lasts like metal and is in every way the equal of metal save for the noise.

You can get New Process Pinions on short notice to fit machines now in service. Make the trial on one drive. Tell us your requirements and ask for booklet, "Noiseless Gearing."

NEW PROCESS IS TO ALL OTHER RAWHIDE AS STEEL IS TO IRON

The NEW PROCESS RAW HIDE Co.

OFFICE & WORKS SYRACUSE, N.Y.

N.P.R.H

A Light Pulley Should Carry Weight With You, Mr. Mill Man



You save one h.p. for every ton of pulley weight you eliminate.

Where cast iron pulleys are used, there is an enormous weight.

"ONEIDA" Steel Pulleys weigh but one-quarter to one-third as much as cast iron. They enable you to save 60 to 75 per cent. of your total pulley weight—and a corresponding saving in power is the result. Are you on? Catalogue?

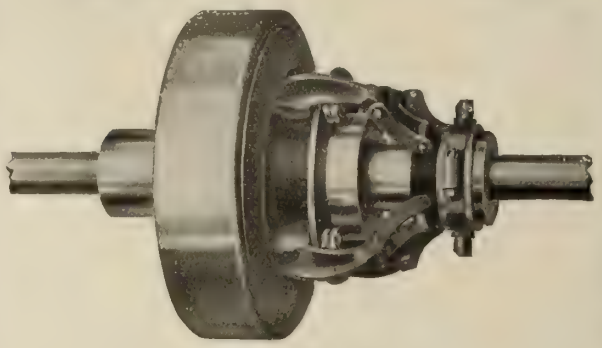
Oneida Steel Pulley Co.
Oneida, N.Y.

The

"POSITIVE" Combined Jaw and Friction Clutch

WILL ELIMINATE YOUR CLUTCH TROUBLES

SIMPLY POSITIVELY
POSITIVE SIMPLE

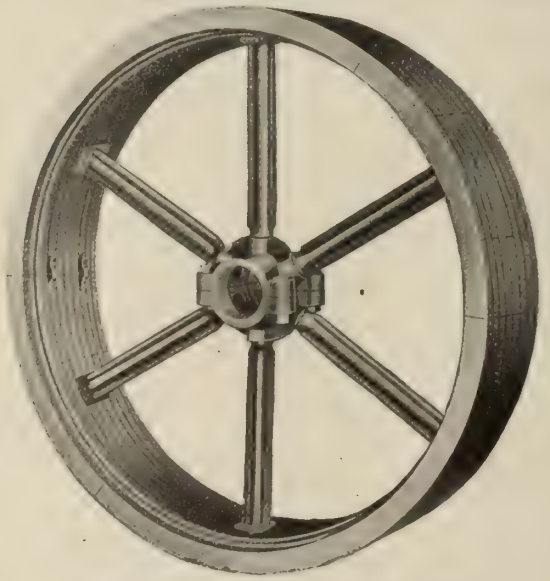


As it Appears in Service

The only positive clutch that can be operated under load.

"POSITIVE" COMBINATION SPLIT PULLEYS

Positive saving in power. Positive grip on shaft.



Wood Rim Steel Arm Malleable Hub

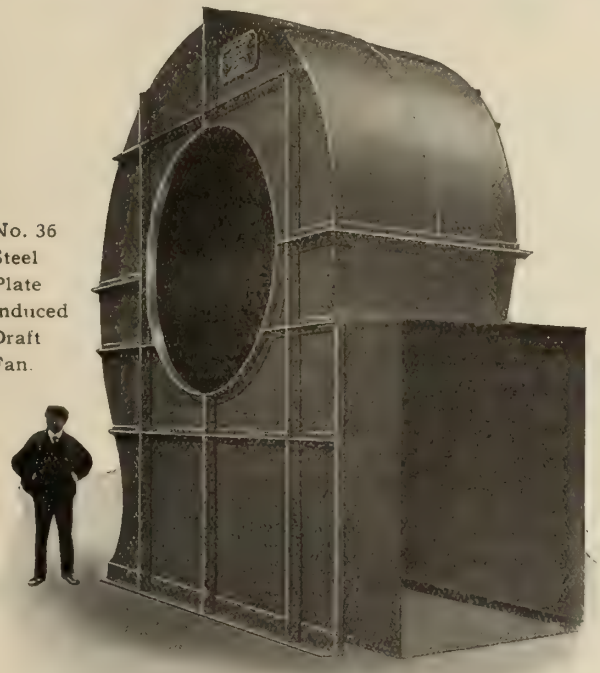
Save the entire cost in less than one year.

Write to-day for complete catalogue

The Positive Clutch & Pulley Works, Ltd.

11-13 Jarvis St., TORONTO, Ont.

CYCLONE FANS



No. 36 Steel Plate Induced Draft Fan.

When installed for supplying MECHANICAL DRAUGHT to boilers always prove to be a paying investment because they INCREASE THE EVAPORATION of the boilers and so insure a constant supply of steam.

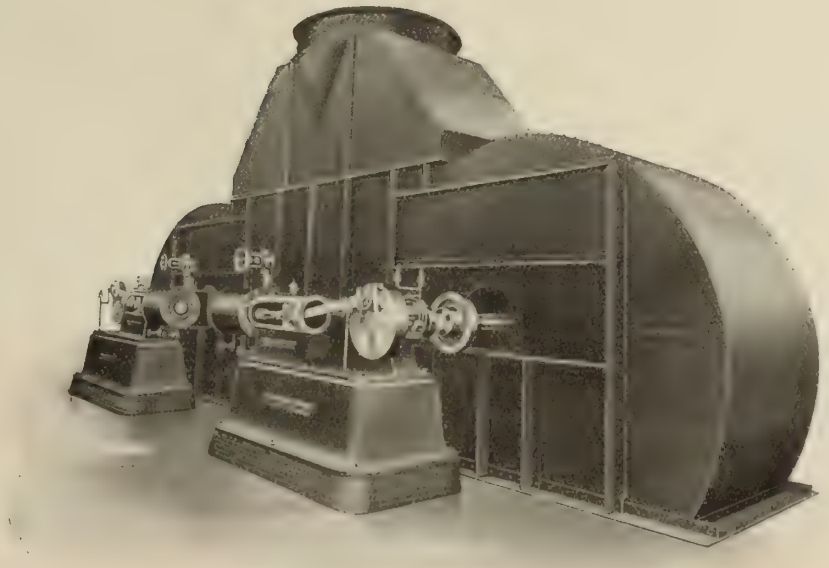
They also REDUCE THE COAL BILL by making it possible to burn a cheaper fuel, and DISPENSE WITH BLACK SMOKE by enabling the fires to extract the full caloric value from the fuel.

ASK OUR AGENTS FOR SPECIAL BOOKLET No. 131

Matthews & Yates, Ltd.

Swinton, Manchester, England

Agents for Canada: Bain & Mitchell, Y.M.C.A. Bldg., Montreal
Anglo-American Supply Co., Ltd., 311 Enderton Bldg., Winnipeg



Burn Cheap Fuel

With the Sheldon Mechanical Induced Draft System you can cut the cost of fuel in half, by utilizing a cheaper grade, or can secure better and almost smokeless combustion from the same grade of fuel that you are now using.

Send for Catalogue No. 14

SHELDONS LIMITED - GALT, ONTARIO

Three Ways of Saying the Same Thing—



THE
Waterous Engine Works Co., Limited
BRANTFORD - CANADA

Start the New Year right.

Cut down the cost of your Light and Power production.

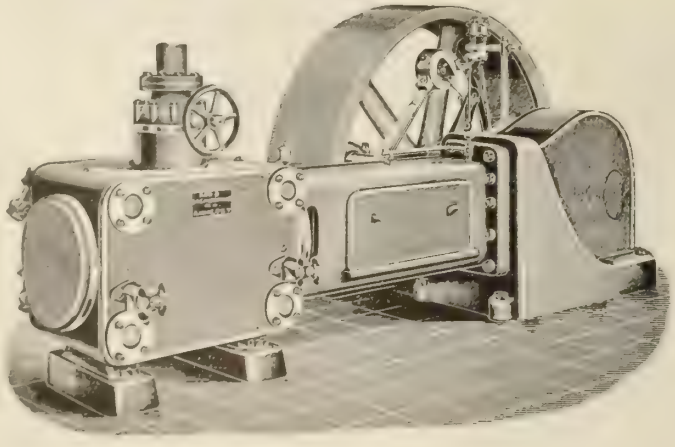
INSTALL A "McEWEN"

The McEwen Engine is built with special reference to use in the production of electrical energy. A high grade, high speed, automatic Engine that is essentially a steam, time and worry saver.

Built in simple and Compound units of from 10 to 700 h.p. From this variety you can be sure to get just the one which your conditions require.

Send for Our McEwen Bulletin.

Robb Corliss Engines



Have the Armstrong-Corliss valve gear, which will operate at a higher speed than the ordinary releasing gear.

This valve gear does not depend on springs or dash pots for closing, and runs without noise.

The wearing parts of the valve gear are enclosed in a casing and run in oil so that friction is reduced to a minimum.

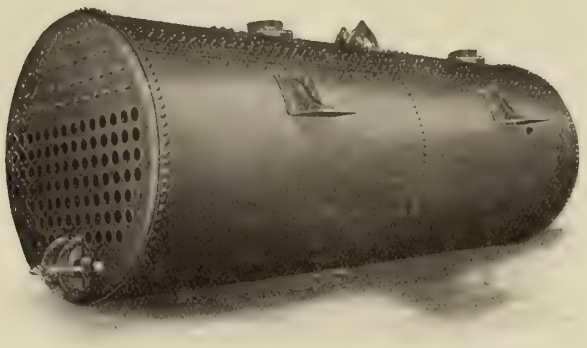
Robb Engineering Co. LIMITED
AMHERST, N.S.

DISTRICT OFFICES:

Canadian Express Building, Montreal	R. W. Robb, Manager
Traders Bank Building, Toronto -	Wm. McKay, "
Union Bank Building, Winnipeg "	W. F. Porter, "
Grain Exchange Building, Calgary '	J. F. Porter, "

The advertiser would like to know where you saw his advertisement—tell him.

BOILERS



"INGLIS" is the buy word for Boilers.

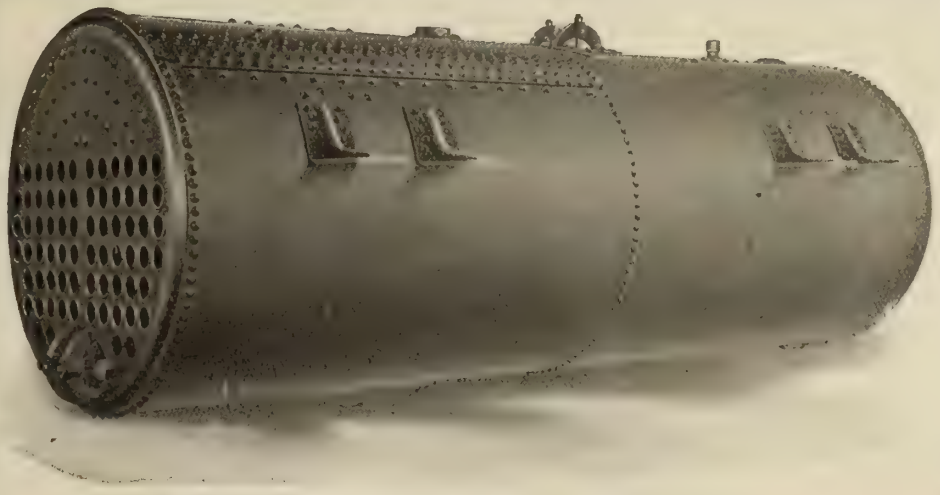
"INGLIS" Boilers represent the highest test of perfection and design, workmanship and material.

We make all kinds for any service. Let our salesmen tell you about Inglis Boilers.

The John Inglis Company, Limited

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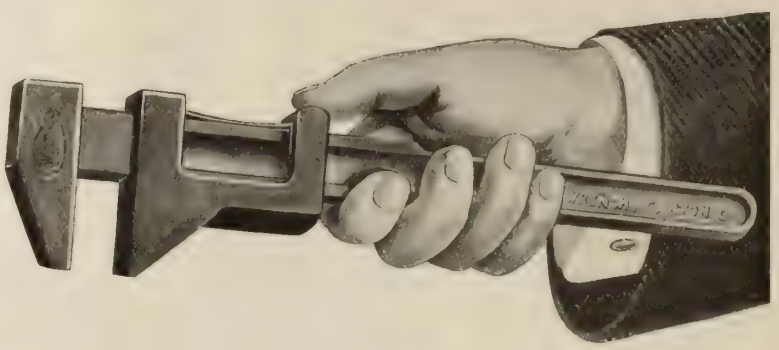
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The Wright Wrench is made in the following sizes—6 inch, 8 inch, 10 inch, 12 inch, 15 inch, 18 inch. Also Automobile Wrenches in 8 inch and 10 inch size. Handles in all cases are drop-forged as part of bar.

Sample of the 10-inch wrench will be sent express prepaid to any point in Canada on receipt of $1.00.

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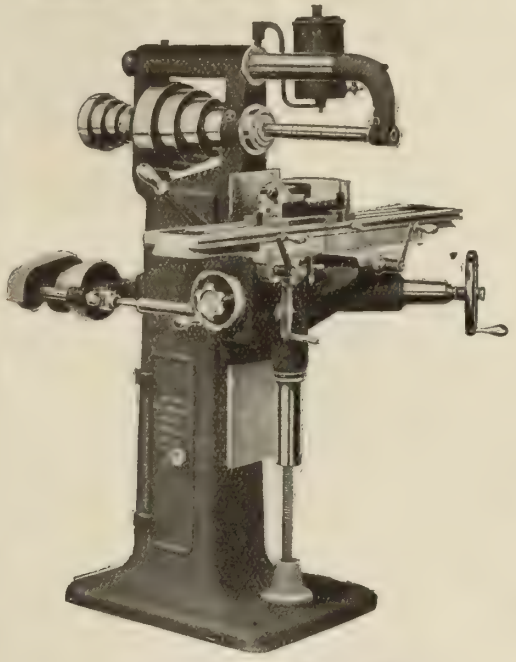
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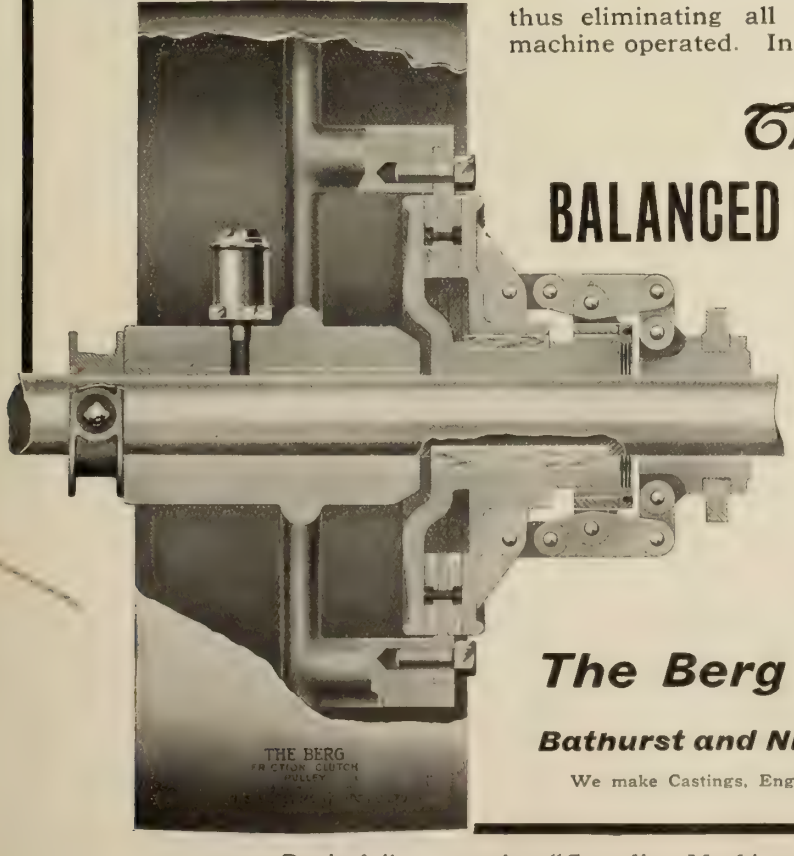
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BALANCED FRICTION CLUTCH PULLEY

has been used with the utmost satisfaction on over a thousand machines of various kinds.

It can be started as gradually as desired. Frictions are made of fibre---not wood, and the pulley is brass bushed.

We guarantee each clutch to carry its rated capacity with ease.

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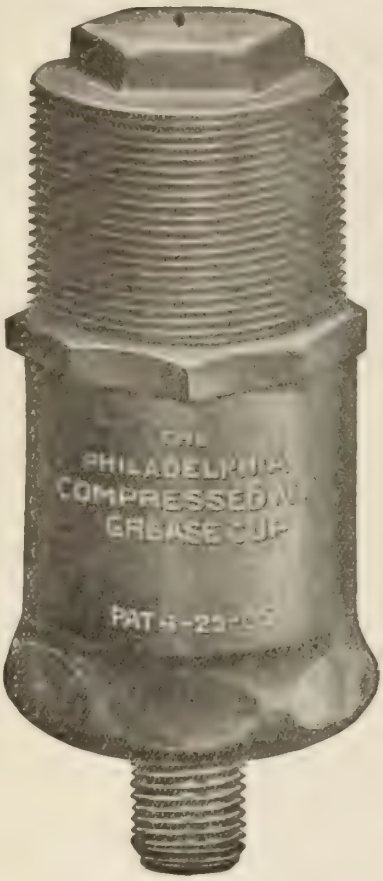
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Peterborough Lubricator Mfg. Co., Ltd.

PETERBOROUGH, ONTARIO

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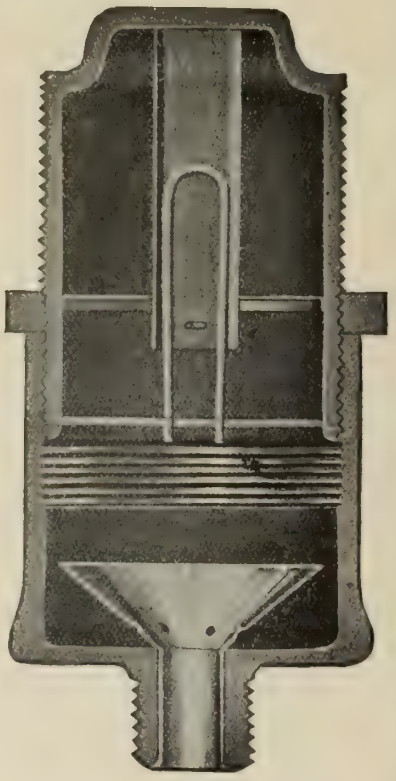
For the Dominion of Canada



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First—The "**Philadelphia**" is guaranteed to save from 33 1-3 to 50 per cent. (with any standard grease) over any other system of lubricating machinery bearings.

Second—The "**Philadelphia**" is not a "new" grease cup. Several years hard service in all parts of the country under every condition, on all kinds of machinery has proved every claim made for them.

Third—The "Philadelphia" is the only automatic grease cup on the market in which compressed air is the feeding force.

Fourth—Because compressed air is used, the "**Philadelphia**" is the only cup in which the pressure is absolutely uniform from the time the cup is full of grease until the last drop is used.

Fifth—The pressure always being uniform is what guarantees that the consistency of the grease never changes in a "**Philadelphia**" cup. By this a saving which cannot be accomplished in any other cup.

Sixth—It is for these reasons that the "**Philadelphia**" cup is just as positive in action feeding up, down, horizontally, or in any position.

Seventh—Neither is the efficiency of the "**Philadelphia**" affected by centrifugal force when used on such positions as loose pulleys, etc.

Eight—The "**Philadelphia**" is absolutely dust proof.

Ninth—The engineer profits by the use of "**Philadelphia**" cups in the big saving of his time and labor, to say nothing of the attendant peace of mind as to the condition of his journals or the increased efficiency and decreased expense account he can show.

Tenth—"**Philadelphia**" cups appeal to the man who pays the bills because they are not only cheaper in first cost than spring or force feed cups, but effect a 33 1-3 to 50 per cent. saving in grease and cost of operation.

Sizes of Cups Manufactured—½-oz. 1-oz. 3-oz. 6-oz. Plain Steel and Polished.

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MILLIONS WASTED

By Users of "Genuine" Babbitt

The high price of tin, which is controlled by manipulators, who can juggle the price up or down to suit their convenience, should cause users of "Genuine" Babbitt to consider seriously the advisability of adopting some cheaper, suitable substitute.

A "Genuine" Babbitt should contain about 88 per cent. tin. It is a notorious fact that tin is a very dry metal and it is by no means what it is claimed to be as a bearing metal, as its anti-frictional qualities are comparatively very poor. A "Genuine" Babbitt will not fill in the interstices and condition the shaft as Magnolia Metal does. Unless a "Genuine" bearing is kept flooded with oil it is liable to become hot and run out, whereas a Magnolia-lined bearing, under the same conditions, will more that likely run for years without any perceptible rise in temperature, on very scant lubrication. Unless a bearing metal is poured in a *separated condition* the weight of the shaft will rarely, if ever, cause it to squash. It is usually frictional heat that causes this trouble, to which "Genuine" Babbitt is very susceptible, and, therefore, it naturally follows that a high-grade, anti-friction metal like Magnolia is very much more dependable. Not only is Magnolia superior anti-frictionally, it will actually withstand 19 per cent. greater compression test than "Genuine" Babbitt. Thousands of practical users have made this discovery and are using Magnolia in preference to all other bearing metals.

Some years ago we had Dr. Torrey, Chief Assayer of the U. S. Mint, New York, test all the leading "Genuine" Babbitts then on the market. Every one of these Genuines ran out in from five to fifteen minutes under pressures ranging from 500 lbs. to 1,400 lbs. per square inch, whereas Magnolia ran at the same speed—1,600 revolutions per minute—for eighty minutes up to 2,000 lbs. per square inch, and came out of test in a perfect, highly-polished condition. It is very difficult to run the temperature of a Magnolia-lined bearing up to a destructive point.

Every civilized country of the world has contributed its quota of testimonials regarding the splendid results obtained from using Magnolia Metal. If you are using "Genuine," or any other bearing metal, we ask your careful consideration as to the merits of Magnolia. Magnolia is made of selected virgin materials of the best quality, which are still further cleaned, and graphite incorporated into it. Magnolia is idealic in all of the good qualities that go to make an all-around first-class bearing metal.

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The only Belting good enough for you is the belting that can be relied upon to stand up to the hardest work. That describes—

LEATHER "CLIMAX" BELTING

Why not join the large army of satisfied users who know by experience that "Climax" is absolutely reliable?

We guarantee every inch of "Climax." Write for Price List.

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FULL STOCK AT ALL PLACES.

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The Machine that does it

"SPOT WELDING" or Riveting Without Rivets

HOW IT'S DONE

- Take two pieces of sheet metal, lay one across the other on the lower die.
- Pull the lever arm shown on the head of the machine.
- This forces the upper die down until the metal is clamped between the upper and lower die.
- Touch the switch, and quick as a flash the weld is made.
- Lightning in a condensed form is what does it.
- The electricity goes through the sheet iron and fuses the metal at a point or spot the size of a rivet. Welds it right and tight.
- That's why it's called "spot" or "point" welding.
- NO PREPARATION OF STOCK NECESSARY.
- No projections or holes to punch,
- Saves the operations of punching and inserting rivets.
- BETTER AND STRONGER THAN RIVETING.
- We make over twenty different kinds of electric welding machines.

The Catalogue tells about them, and it's yours for the asking.

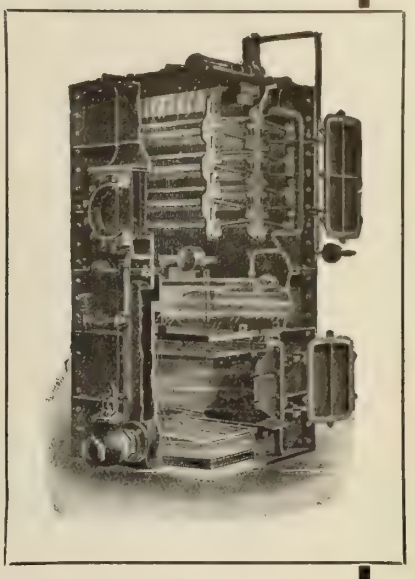
The "Toledo" Electric Welder Co.

CINCINNATI, OHIO, U.S.A.

THE
LANCASHIRE DYNAMO AND MOTOR CO., Ltd.
152-4 Bay Street, Toronto

Motors and Generators —for— all purposes

More Power at Less Cost!



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Will you investigate the merits of the

WEBSTER
Feedwater Heater, Purifier and Filter?

It makes use of all condensations and waste steam, and will positively rid your boiler of scale by removing all scale-forming elements from your feedwater. Using pure water means getting every ounce of power out of your boiler with a *smaller* amount of fuel.

Our descriptive literature has many points of interest for you! Send for it TO-DAY.

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DON'T PAY FOR BELTS YOU CAN'T USE.—You do not have to cut out and waste short lengths of belt every time slack is taken up, if you are using

Goodhue Belts

If your dealer doesn't stock our Belts write us for prices

Because these belts stretch less by 15% to 25% than any others.

This happy result is obtained by extra care given to the stretching of the belt, and by the exclusion of all unstretched parts in the make-up.

According to the conditions in which the belt has to be used, we recommend our "Extra," "Standard" or "Acme Waterproof" Belts. Guaranteed reliable and economical.

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ROSSLAND VANCOUVER

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It makes no difference whether the pipe is long or short, in a trench, or in an open space, you can take the Forbes to the job, saving carting and labor.

Catalog ?

The Curtis & Curtis Co.

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STEEL CASTINGS

By the TROPENAS CONVERTER PROCESS

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High Grade Grey Iron Castings and Pattern Work

Parker Foundry Company, Limited

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GREY IRON FOUNDRY
18-27 DALHOUSIE ST.

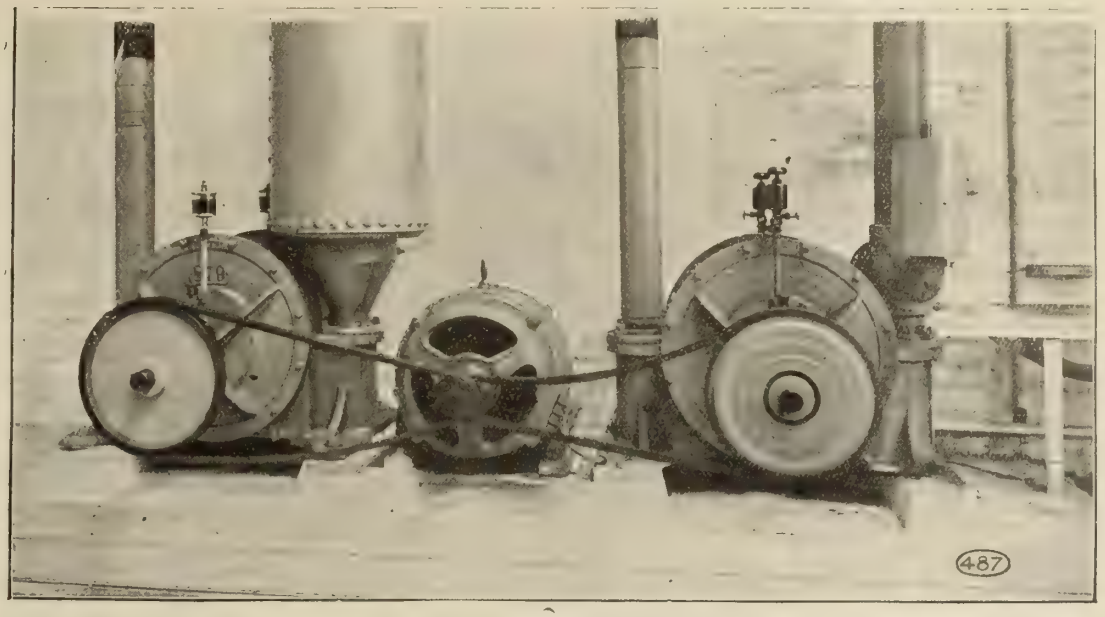
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Renold Patent Silent Chain Drives

MANUFACTURED SOLELY BY HANS RENOLD, Ltd., MANCHESTER, ENG.

Maintain an efficiency of 98.2 per cent., and compared with maximum efficiency of high grade belts, effect a continual saving of power.

Quiet and Smooth-Running



Not Affected by Heat or Dampness

A motor driving two blowers, in motion, one with air vessel, the other without. The one to the right without air vessel is fitted with a spring cushion sprocket. Note the smooth running.

This chain consists of:

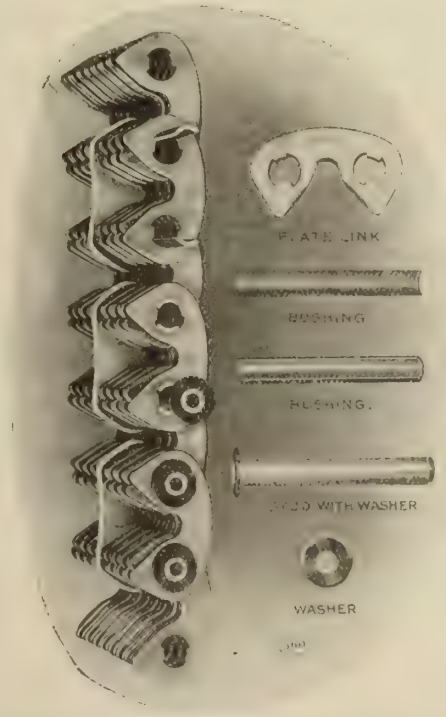
Plates with working angles ground true

Hardened segmental bushings.

Hardened shouldered studs, which are free to rotate.

Washers.

Centre-Guiding Plates.



Showing Patent Bearings of the Renold Silent Chain and giving General Construction.

ABSOLUTELY RELIABLE

The friction comes on tempered and lubricated hard-steel surfaces, while the bearing surface is the maximum possible in chain construction. The pin revolving inside the bushings providing an even distribution of wear at each point and prevents stretch.

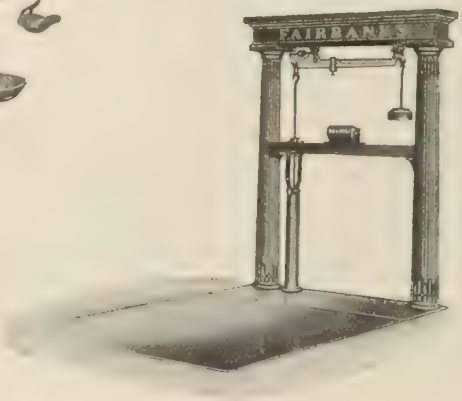
WRITE FOR CATALOGUE and particulars of drives we have now running in your neighborhood.

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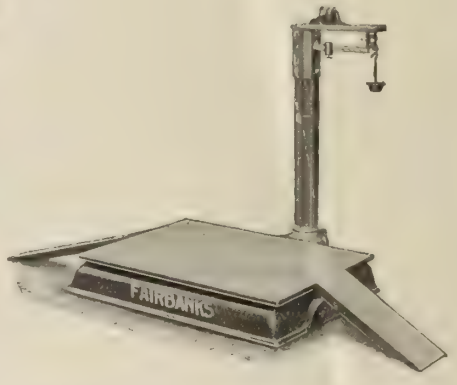
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THESE THREE FAIRBANKS SCALES WILL TELL YOU

No chance for an error will exist if you provide WEIGHT CHECKS on the different operations your product undergoes. Shrinkage and losses from stock improperly cut affect costs to a large extent. Can you state what per cent. of shrinkage you have to contend with? Decide now to get evidence of QUANTITY—our new scale Catalogue No. 11 will tell you the best scale to use. Send for it.

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Fairbanks Scales—Fairbanks-Morse Gas Engines—Safes and Vaults

MONTREAL TORONTO ST. JOHN, N.B. WINNIPEG SASKATOON CALGARY VANCOUVER

The advertiser would like to know where you saw his advertisement—tell him.

Modern Machine Tool Practice for Maximum Production

By Gordon C. Keith

The Past Few Years Have Seen Great Advances Made in Machine Tool Practice. The Whole Line of Machine Tools Were Re-designed so that High-speed Steels Could be Used to Their Full Capacity. It was then Necessary to Devise Equipment for Keeping the Machines in Operation the Greatest Percentage of Working Hours. In Other Words, it was Necessary to Cut Time Between Cuts. This Paper, Read Before the Central Railway and Engineering Club, Toronto, Dec. 20, 1910, Shows the Development of Machine Tools, and Also the Devices Designed in Order That Time Between Cuts May be Reduced to a Minimum and that Maximum Production May be Obtained.

Since the introduction of high speed steels and motor drive, there has been such a revolution in machine tool design that it is only now that the present status of machine tool practice may be definitely defined. A complete redesign of machine tools has been necessitated and all the changes made and new methods adopted have had the one object in view, viz. that of obtaining maximum production.

The starting point in obtaining maximum production has been the proper care of tools. In a number of Canadian shops it has been recognized, as it has also been in United States shops, that a central tool room with a man in charge is a large factor in securing maximum production. The shapes and sizes of lathe tools, boring cutters, chisels, the method of forging and treating the tools should be standardized as should also all shop equipment, clamping bolts, wrenches, etc. Even in the smaller shops, such as that of the Toronto Street Railway and other railroad repair shops, it has been found to pay to have one man grinding all the tools and have charge of the tool room. All carelessness with tools and ignorance in the selection of tools for certain work is eliminated by having the tools prepared and selected in advance, and kept in good shape, thus assisting in securing maximum production.

Probably the best illustration of a central tool room is that of the United States Navy Department, located at League Island, Philadelphia, Pa., for supplying the Atlantic Coast Navy yards. Standard chemical and physical specifications for high speed steel have been adopted. The plant has a capacity of 800 tools per day, and consists of a forge shop, treating department of chemical and physical test, together with the apparatus necessary for producing standard tools of the highest quality at minimum cost. Tools are made in such quantities as to ensure economical manufacture, and are carried in stock.

The apparatus necessary and the methods of using it as followed in the forging plant, are compiled on instruction charts, one of which is shown in Fig. 1. This covers the forging of straight round-nose roughing tools, right or left hand, giving the necessary dimensions and graphic instructions for using the applicances.

The enormous railway mileage in Canada and the United States has resulted in great advances being made in railway shop equipment and a statement of what is being accomplished with modern machine tools and high speed steels in the shops should prove of interest. A few years ago six pairs of car wheels per day was the maximum production. Machine tools have since been brought to a constantly high state of efficiency until the best lathes, of five years ago, averaged about twelve pairs per day. Within the past two or three years this output has been steadily increased by improvements in design and methods of handling until at the present time many railroads are equipped with lathes turning out from sixteen to twenty pairs of 36-inch standard make wheels in ten hours.

Record Production.

On May 11, 1910, a detailed record was kept on tire turning on a Niles-Bement-Pond wheel lathe at the West Albany shops of the New York Central & Hudson River Railroad. It will be noted in Fig. 2, that thirty-three pairs of 36-inch wheels were turned in 9 hours and 53 minutes, being an average of 17 minutes and 58 seconds per pair.

Wheel lathes were gradually increased in weight and power until it was finally found that the wheels and axles themselves were the weak point in the turning operation. Recognizing this fact Small & McNaughton brought out twenty years ago a design of a machine to overcome this difficulty. This lathe was at that time a radical departure from ordinary design. The turning of axles on centres was abandoned, the entire axle journal being received in the head by means of a split bush made to fit the axle and having its exterior turned taper. This eliminated the obvious weakness and hence springing of the centre and its projecting spindle. It held the axle rigidly close up to the wheel. The old form of wheel lathe was driven from one end and the power carried across the machine by a long shaft. This put an inevitable amount of torsion and lack of rigidity between the point at which the power was applied and the wheel to be turned at the other end of the axle, and it was found to be one serious source of vibration and chatter. So to overcome this difficulty the Small & McNaughton design was driven by a large spinal gear in the centre, having a gap through which the axle could be rolled. The power from the large central drive was furnished to each wheel through face plates. The outside spindles supporting the axle were also provided with face plates and chucks, hence the wheels were clamped rigidly between two staunch face plates driven from one and chucked by the other; thus the wheels were held with absolute rigidity and became, in fact, one with the machine itself.

On a modern wheel lathe no attention is paid to the hard skin of the tire caused by friction of the wheels and brake shoes, for the simple reason that the tool is put directly under this scale and a heavy roughing cut can be fed across in eight or nine minutes. After that, a finishing tool is used the full width and shape of the tire and fed directly in without any use of cross-feed, a third tool the shape of the flange finishing the operation. The increased output of modern lathes, comes from their great weight and power and improved facilities for handling and getting the wheels in and out of the lathe, and from the higher quality tool steel.

After the capacity of the wheel lathe got up to twenty or more pairs of wheels a day, the manual labor of clamping and unclamping the cutting tools became quite a serious matter for the operator, and a number of devices have been brought out to lighten and quicken this operation. The limit of human endurance comes into the problem and here clamping and unclamping, if it had to be done with a wrench on say twenty pairs of wheels per day, it would mean 350 to 400 manipulations in ten hours.

One device that has been brought out is in the form of a turret tool-holder which has the roughing and finishing tools set in it, the holder being rotated to bring the various forms into action.

Another device is a pneumatic clamp by which the operator simply opens a compressed air valve and clamps his tool by power. In this arrangement the air cylinder is built in the body of tool rest ; the piston carries a wedge which, operating between two rollers, forces up the long end of the clamping lever. Thus the operator is relived from several hundred strenuous muscular exertions leaving him more efficient to attend to the actual turning operations.

Sellers' 42-in. Car-wheel Lathe.

The Williams Sellers Co., Philadelphia, Pa., have developed a 42-in. car-wheel lathe, which illustrates what machine tool builders are accomplishing in the way of production in the railroad shop. It has been pointed out above, that a few years ago ten pairs per day was considered a good record. The rate has been constantly increased until an average of twenty minutes per pair has been obtained. This exemplifies the economies in railrod shop machine tool practice that have recently been brought about.

For the test of the Sellers lathe three pairs of 36-inch steel-tired wheels, selected at random from a large number shipped to the machine builders' plant by the Reading Railroad Co., were turned in an average of about 20 minutes per pair, including setting machinery and taking out of lathe. The actual time that the machine was in operation averaged about 18 minutes per pair, and 90 per cent. of the total time required represents the period that the machine was doing effective work.

The cut and feed during the test was $\frac{3}{8}$-inch each, taken at a speed of from 15 to 19 feet per minute. The time taken from floor to floor of a pair of wheels, as well as the other details of the test, are given in the following table :

	No. 1.		No. 2.		No. 3.		Engine truck whls.	
Diam. wheel finished	34⅜ in.		34 3-16 in.		34 11-16 in.		30⅝ in.	
Diam. Wheel rough	35½ in.		34 15-16 in.		34¼ in.		.....	
	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.
Floor to chuck	1	5	2	6	1	18	1	2
Turning	17	8	16	2	18	17	13	55
Machine to floor	1	2	1	17		50		1
Total time	19	47	18	45	19	85	15	15
Cutting speed ft. min.	15 and		16	16		14		19

Time to change from turning tender to engine truck wheels, 6 min. 1 sec.

The operation of the machine during these tests was in the hands of William Anthony of the Reading shops of the Philadelphia and Reading Railroad.

In these tests the final finish was remarkably fine. There was not a trace of chatter to be found, and the surfaces of the treads were free from those fine cracks extending down into the metal that are so characteristic of surfaces from which metal has been removed in heavy cuts at high speeds. The reproductions of photographs of these surfaces taken first after roughing and then after the finishing cut, show the effect very clearly.

The method of procedure is the usual one. The wheels are set in position and the roughing tool made to take a cut across the tread and top of the flange. The tread and flange tool is then forced in, taking a broad smooth cut, and leaving the surface in excellent condition, already noted. Then comes a similar tool for cutting the taper at the outer edge of the taper and round the corner of the rim. This done, the wheels are finished.

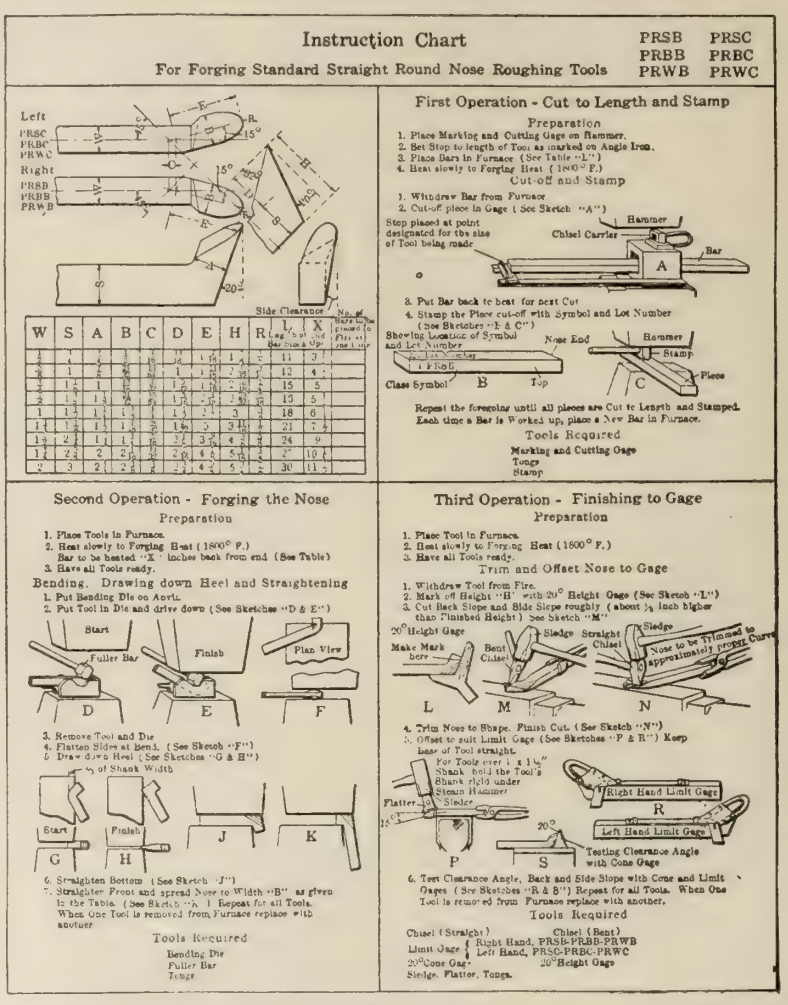


Fig. 1 Forging Instruction Chart used in Central Tool Department of U.S. Navy Yards.

The car wheel is driven by a motor set down on the extension of the bed. The lathe is an example of the application of individual motor drive to machine tools. Exhaustive tests have been made so that the machine tool builder has now no difficulty in selecting the proper power of motor for machining various materials for various combinations of speeds, feeds and depth of cut. Individual motor drive has been adopted in a large number of railway shops, machines of smaller capacities being arranged in groups and driven from a line shaft by one motor.

Sellers' Driving Wheel Lathe.

The high power wheel turning lathe for locomotive driving wheels shown in Fig. 9 is a result of the makers of machine tools trying to raise their capacities up to the cutting possibilities of high-speed steel. The lathe shown has

a swing of 90 inches. It is estimated that when the tool is cutting $\frac{3}{8}$ in. deep with $\frac{1}{2}$-in. feed the pressure at the point is about 55,000 lbs. Such a cut is readily made at a speed of 16 feet per minute, which requires 880,000 ft. lbs. per minute or nearly 27 h.p. at the point of the tool. To do this and avoid chattering the machine has been rigidly constructed. The device is obtained by means of dogs fastened at the rim or tire. The dog has a gripping shoe "A" shown in Fig. 11, and the pointed arm has a set screw "B". The arm swings up between the spokes of the wheel and the two grips come in line with the two faces of the tire. The set screw "B" is then turned in with a heavy wrench until its point has penetrated the metal and the shoe "A" has a firm grip. This shoe "A" is held in line and in place by the sides of the holding bracket, but the set screw "B" has a slight swinging motion. When the lathe is started, the shoe "A" drives the wheel through the tire, but if there be any slip the set screw "B" hangs back with the tire and in so doing gets out of alignment with "A". The slotted hole in the dog makes this possible, and as this lessens the distance between "A" and "B" the former is drawn into the metal of the tire, tightening the grip. When this grip exceeds the thrust of the tool, the tire will turn and the cutting proceed.

In testing the lathes, the cutting was limited to a speed of 13 ft. per minute, with a cut and feed of $\frac{1}{2}$-in., but it can be speeded to 25 ft. per minute and remove the same amount of metal, but the high speed steels will not stand the strain and heat. With a $\frac{3}{8}$ in. cut and $\frac{1}{2}$-in. feed the tool and the metal it is cutting, are at a red heat at the point of contact.

A demonstration was recently made in which the lathe was set complete for turning wheels of 78 inches diameter with $6\frac{1}{4}$ in. tires in 12 minutes, including the placing of the wheels in position for work. They were then finished complete in 19 minutes and placed on the floor in four minutes more. The total time from floor to floor, including the setting of the lathes, was 35 minutes. This work was the same as the turning off of a new set of tires and the cut was but $\frac{1}{8}$-in. deep.

In another test, a pair of 67 inch

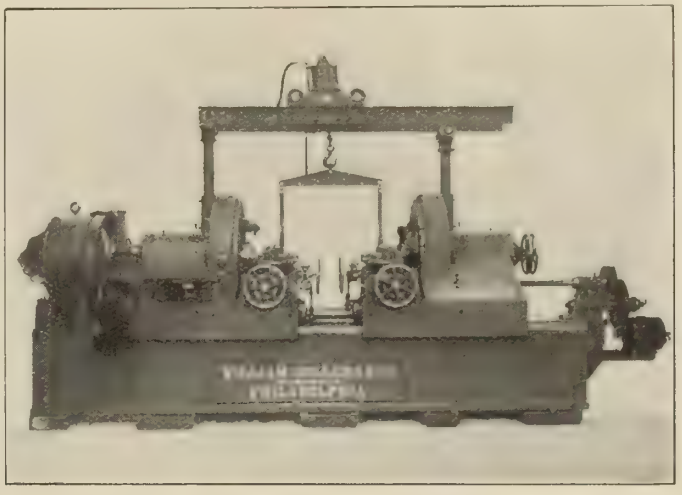


Fig. 3—William Sellers & Co. 42-in. Car Wheel Lathe.

DATA OF TEST OF NILES-BEMENT-POND CAR-WHEEL LATHE.

Pond 42-inch motor-driven car-wheel lathe

At West Albany Car Shops, N.Y.C. & H.R. R.R. 36-inch Krupp and Paige wheels,

May 11, 1910.

Continuous Run from 7 a.m. until 5.53 p.m., one hour for nooning.

Pair No.	1	2	3	4	5	6	7	8	9	10	11	Average.
Putting in lathe	3	2	2	3	2	2	2	3	2	3	2	2 min., 28 sec.
Roughing	11	8	9	9	9	9	9	9	11	10	10	9 min., 23 sec.
Finishing	5	6	4	3	5	4	6	4	7	5	5	5 min., 7 sec.
Taking out	1	1	1	1	1	1	1	1	1	1	1	1 min., 0 sec.
Time from floor to floor	20	17	16	16	17	16	18	17	21	19	18	17 min., 58 sec.
Depth of cut	$\frac{1}{4}$	$\frac{1}{8}$	3-16	$\frac{1}{4}$	3-16	$\frac{1}{8}$	$\frac{1}{8}$	3-16	3-16	$\frac{1}{4}$	3-16	3-16 inch.
Feed	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32 inch.
Speed	16	16	17	15	14	12	13	18	12	14	15	14.4 feet.

Pair No.	12	13	14	15	16	17	18	19	20	21	22	Average.
Putting in lathe	2	4	2	2	2	4	3	2	2	3	3	2 min., 28 sec.
Roughing	9	11	12	8	9	8	10	8	9	9	11	9 min., 23 sec.
Finishing	5	5	8	4	5	4	6	7	5	5	6	5 min., 7 sec.
Taking out	1	1	1	1	1	1	1	1	1	1	1	1 min., 0 sec.
Time from floor to floor	17	21	23	15	17	17	20	18	17	18	21	17 min., 58 sec.
Depth of cut	$\frac{1}{8}$	3-16	$\frac{1}{2}$	$\frac{1}{8}$	3-16	3-16	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	3-16	3-16	3-16 inch.
Feed	13-32	13-32	5-16	13-32	13-32	13-32	3-32	13-32	13-32	3-32	3-32	13-32 inch.
Speed	15	13	10	14	12	15	11	12	10	14	12	14.4 feet.

Pair No.	23	24	25	26	27	28	29	30	31	32	33	Average.
Putting in lathe	2	3	2	2	3	3	3	3	3	1	1	2 min., 28 sec.
Roughing	9	11	9	10	7	10	9	10	10	7	10	9 min., 23 sec.
Finishing	5	6	5	6	5	6	5	4	3	5	5	5 min., 7 sec.
Taking out	1	1	1	1	1	1	1	1	1	1	1	1 min., 0 sec.
Time from floor to floor	17	21	17	19	16	20	18	18	17	14	17	17 min., 58 sec.
Depth of cut	$\frac{1}{4}$	3-16	$\frac{1}{8}$	$\frac{1}{8}$	3-16	$\frac{1}{4}$	3-16	3-16	$\frac{1}{8}$	3-16	$\frac{1}{4}$	3-16 inch.
Feed	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32	13-32 inch.
Speed	14	13	11	14	20	15	17	17	16	21	18	14.4 feet.

Average time for turning, 17 min., 58 sec. Total time for 33 pairs, 9 hours, 53 min.

Fig. 2—Table Showing Test of Niles-Bement-Pond Wheel Lathe.

wheels with 6½ in. tires, were chucked in 7 min., turning complete in 28 min., and put on the floor in 3 minutes more, or a total of 38 min. from floor to floor. In this case the cut was ⅝-in. deep.

A third test was made with 67 in. wheels and 6½ in. tires. They were chucked in 9 min. and finished in 43 min., the breaking of a tool having delayed the work four minutes. The work was done at a cutting speed of from 13 to 15 ft. per min. When a tool steel is produced that can stand the stress and heat of a higher speed no doubt there will be a greater output than modern machine tool practice will allow.



Fig. 4—Worn Wheel taken from Service, Mounted in Chuck

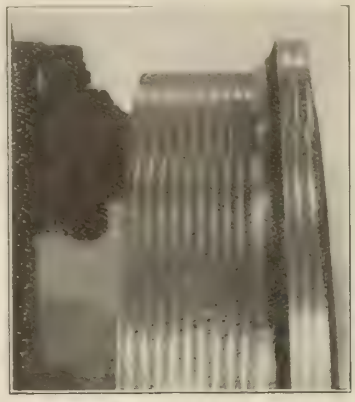


Fig. 5—First Operation Completed, Depth of Cut Averaged ½-in.



Fig. 6—Next Tool has Roughly Formed Flange and Taken off Large Corners.

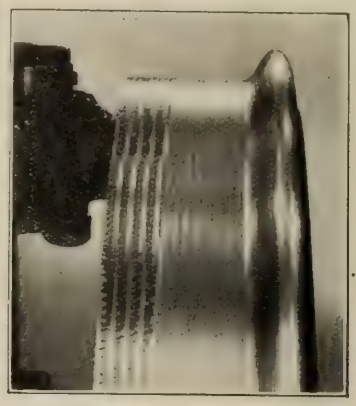


Fig. 7—Condition of Wheel at end of cut of Third Tool.

Landis Grinder.

Fig. 15 illustrates work done on the Landis Universal Grinder, which is built for use in the railroad tool room or repair shops. This grinder grinds reamers, gauges, dies and boring bars, does straight or taper, external or internal grinding and handles a large variety of grinding on small parts such as knuckle pins and cross head pins, link blocks and plates, parts of air valves, etc., with speed and accuracy. The Gap grinder is also a railroad tool, a gap along the bed adapting it to a variety of work and permits grinding accurately worms and racks. The operator standing directly in front of the table can manipulate it forward or back or longitudinally without moving from his position. Springing is eliminated, and the table is supported by a heavy bracket or knee underneath and an elevating screw as well, which it is claimed prevents the slightest spring. A very quick adjustment is obtained with this table. A large chip pan is provided at each end, as well as an oil groove running lengthwise at each side, arranged so that all the lubricant running into the chip pan at the farther end is drained back through a cored opening in the table to the pan nearer the supply tank.



Fig. 8—Wheel Ready for Service



Fig. 10—Wheel in Position.

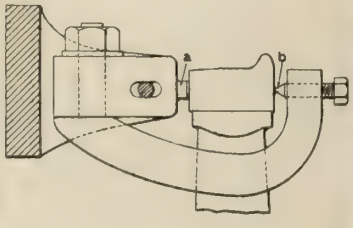


Fig. 11—Driving Dog.

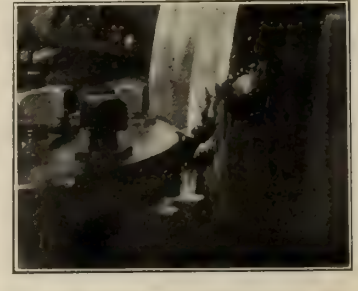


Fig. 12—Taking a Roughing Cut.

Drills for Maximum Production.

At the convention of the American Railway Master Mechanics' and Master Car Builders' Associations at Atlantic City last June, The Colburn Machine Tool Co., Franklin, Pa., exhibited a heavy duty drill that was of unusual interest, not only because of its constructural features, but also by reason of the results in the way of rapid drilling which it makes possible. An improvement which tends to increase the usefulness of the tool is the new compound table.

As will be noticed from Fig. 15 this table is very different from the ordinary type and is a valuable adjunct to the machine. The table has a working surface of 16x30 in. and is provided with a rapid movement of 20 in. longitudinally and 8 in. transversely through

The machine is built on the unit system, that is, the speed changing mechanism is in one separate box, the feed change gears are enclosed in another separate case, and the head is a third unit entirely independent of the other parts.

In a series of tests made using Celfor high speed twist drills, cutting speeds as high as 200 ft. per min. in cast iron were obtained, although 125 to 150 ft. per min. were used in most cases, which was undoubtedly due to the fact that the nature of the work was the limiting factor rather than the drill or the machine itself.

Wheel Lathe.

Fig. 16 shows a modern 90 inch wheel lathe built by the London Machine Tool Co., Hamilton, and installed in the G. T. R. shops at Stratford.

The face plates are very heavy and massive, 91 inch diameter, and have bolted to them an internal gear of wide face and coarse pitch.

The construction of the drive is such

that the long bottom shaft is relieved to a considerable extent of the heavy torsion which invariably causes chatter on this class of machinery.

Clutches and change gears are provided, giving a wide range of speeds for all wheels from 31 inch to 81 inch on the tread.

The feed mechanism is of the link type, designed so as to give 8 impulses of feed per revolution of the face plate.

The bottom rests are moved along the bed by means of rack and pinion, and have extension to allow the cross rest to move in sufficiently close for small wheels.

The traveling head is the striking feature of this machine, and its great value is very apparent, especially on massive jobs where the work cannot be readily moved. This construction also makes it possible to do work requiring a great reach. This construction at first hand is criticised on account of the spring of head under heavy work. In actual practice this spring is found to be very small, owing to the fact that

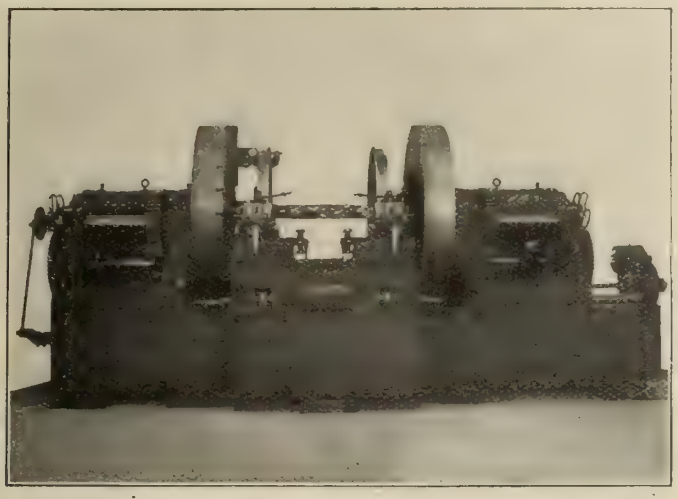


Fig. 9 Front Viewof Sellers' Wheel Lathe.

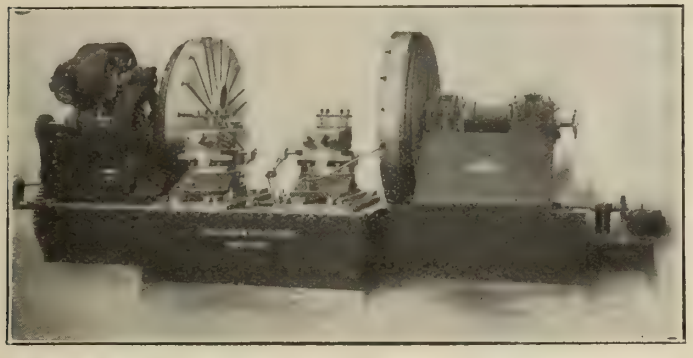


Fig. 16—90-in. Wheel Lathe, London Machine Tool Co., Hamilton.

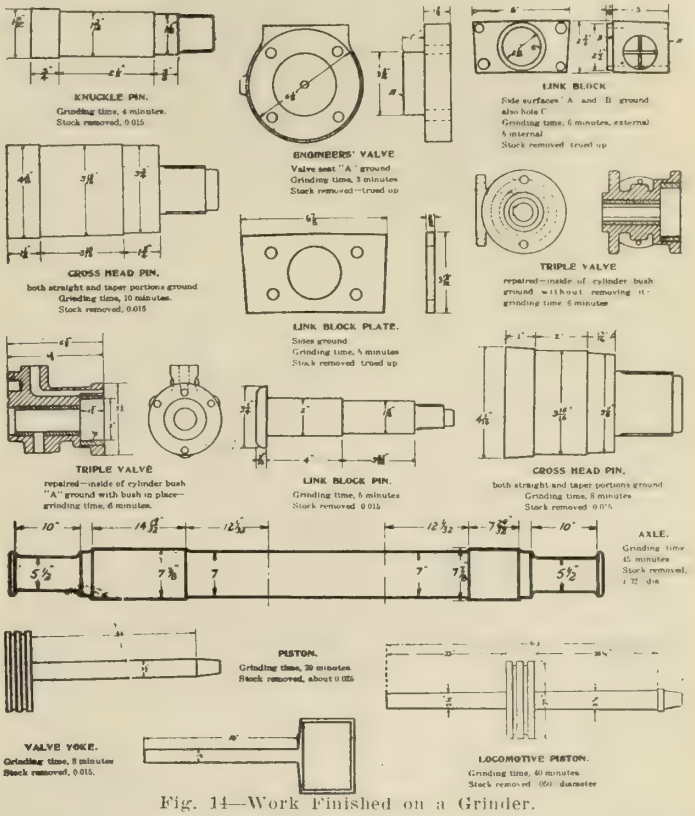


Fig. 14—Work Finished on a Grinder.

The rests are exceptionally massive, having power feed across the tread, varying from 4-25-in. per revolution to 12-25 in. per revolution.

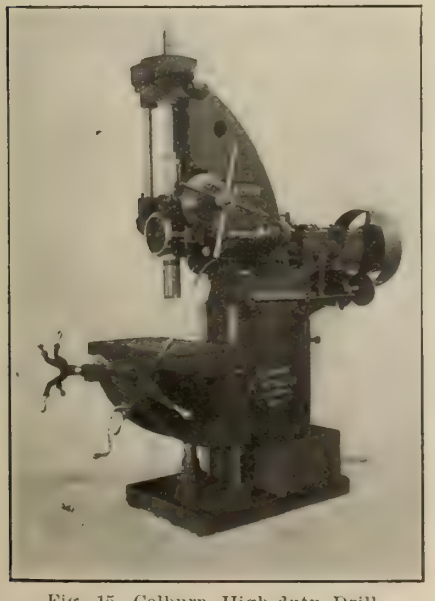


Fig. 15—Colburn High-duty Drill.

The left hand head is driven in and out by means of reversing pulleys acting through gears into a screw placed under the centre of gravity of head.

The drivers on this machine consist of four sets of adjusting steel blocks, having serrated edge gouging into the outside of tire. Powerful bolts are provided for slipping through the arm of the wheel, and drawing the wheel back against the face plate. This makes the wheel practically one with a heavy face plate, giving great rigidity. On a machine with this drive cuts 1 inch deep, and 7-16 inch feed have been taken.

Traveling Head Slotters.

In the design of the traveling head slotter, Fig. 17, the London Machine Tool Co. have taken of the experience of many of the largest users of slotters in the country, particularly in railroad shops where the heaviest service is required. Weak spots have been eliminated, many conveniences have been added, simplifications made in construction, and an excellent machine produced

the upward thrust is taken by two massive long bolts running clear through and anchored in base, and also the column is made very deep and heavy and the head being well scraped thereto makes spring practically negligible.

The quick power adjustment to head and table can be thrown in and out,

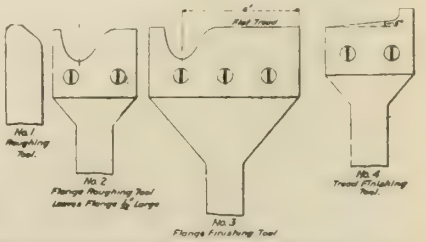


Fig. 13 Tools for Turning Tires on a Sellers Wheel Lathe.

while the head is running or standing, as desired. The quick power feature on certain classes of work means an increase of 200 p.c. in output. By this feature, as a general proposition, this machine will do 50 p.c. more work than was formerly possible. The quick re-

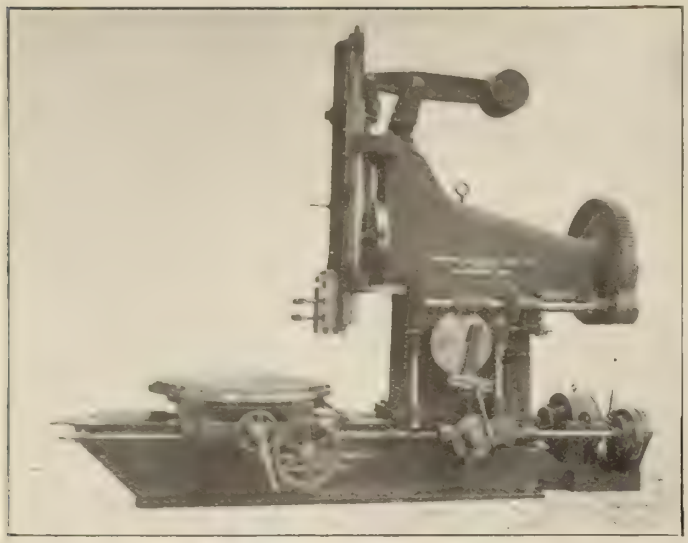


Fig. 17—Traveling Head Slotter.

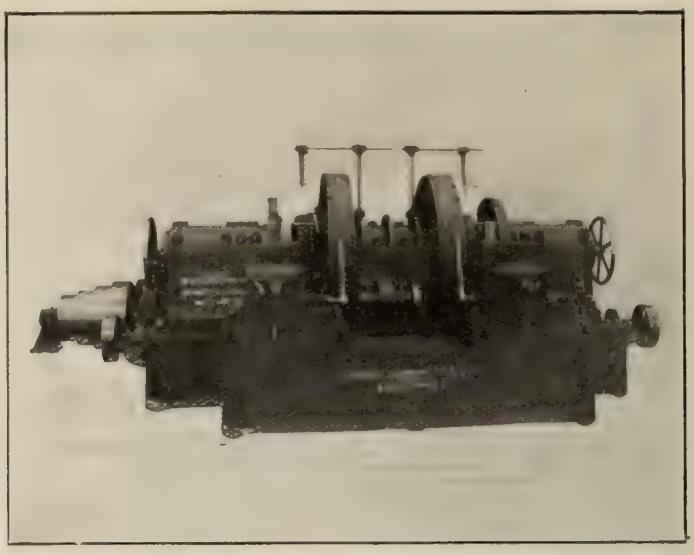


Fig. 18—42-in. Coach Wheel Lathe.

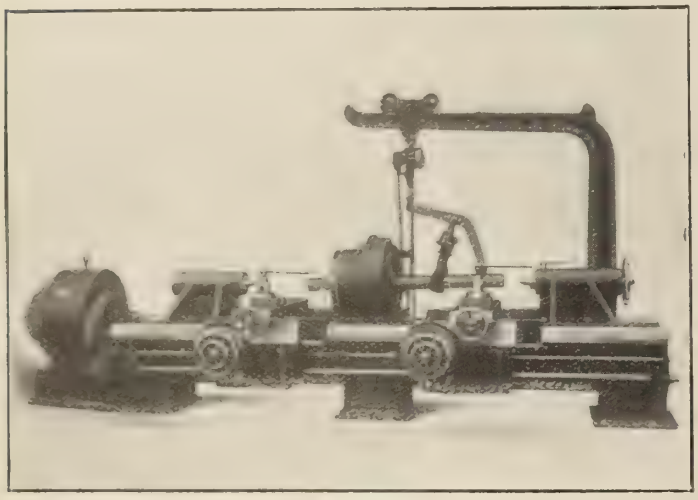


Fig. 19—Double Axle Lathe. London Machine Tool Co., Hamilton.

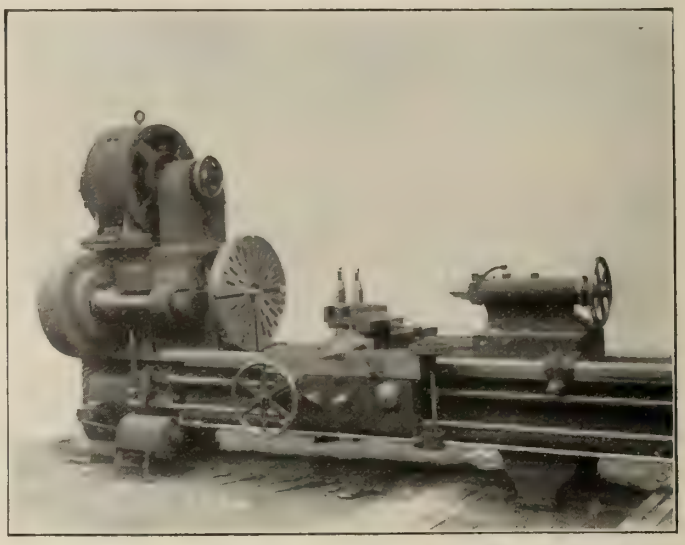


Fig. 20—Double Front Geared High-speed Engine Lathe. John Bertram & Sons Co., Dundas.

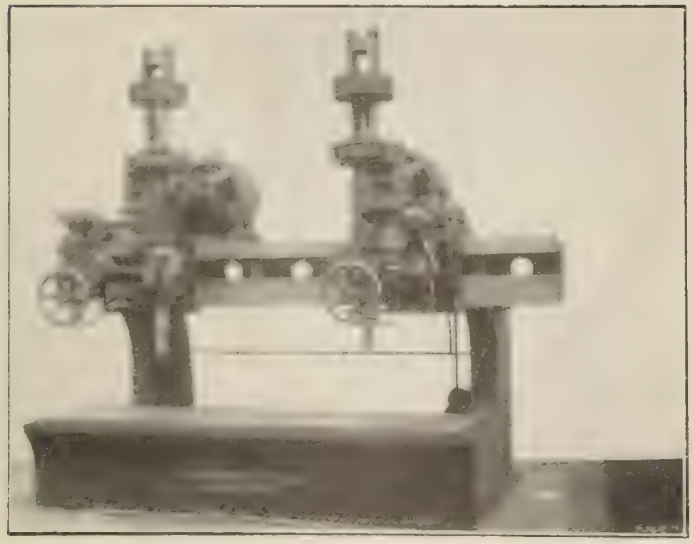


Fig. 21—Bertram 2-spindle Drilling Machine.

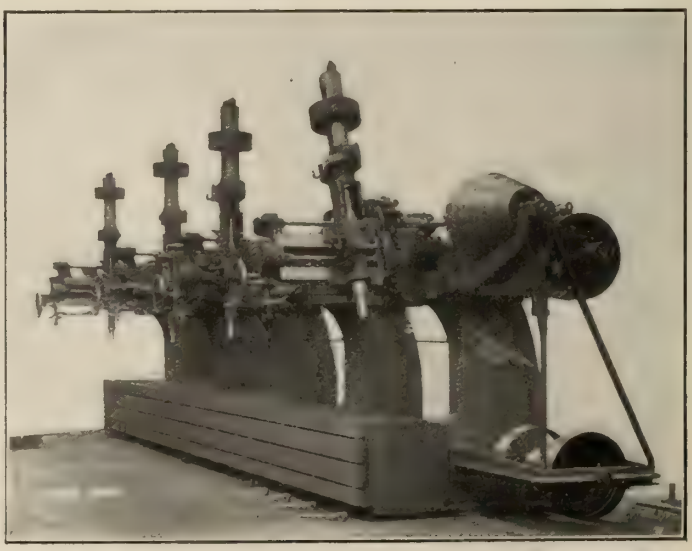


Fig. 22—Bertram 4-head Locomotive Frame Drilling Machine.

turn is of special construction giving remarkably even cutting strokes with very fast return. An indicator is attached showing amount of strokes.

The 42" coach wheel lathe shown in Fig 18 is designed by the London Machine Tool Co., Hamilton, for turning out railway coach wheels at a maximum rate.

The driving mechanism consists of two face plates, 56-in. diameter, and having open cut in same on one side, to admit of axle.

The centre head supporting the two internal gears, has a wide bearing on the base, and is secured to base by heavy bolts and dowels, making an exceptionally rigid construction. The method of taking insert is very simple,

there being merely two screws to loosen up, and the section driven out. On account of the shape of the gear ring it makes an exceptionally rigid construction, by which there is no vibration.

To the face plates are secured drivers of the latest approved form, giving ample driving capac'ty to the machine.

The tailstocks have spindles of large diameter, to which are secured very powerful self-centering chucks for gripping the wheels.

The heads are adjustable in and out for a distance of 12 inches, and are opened by means of screws operated by motors on each end. These motors do not require to be over 2 h.p. capacity each.

The cross slides and rest are extremely massive, and are provided with means for quickly releasing tool and securing it in position. 1½" x 3" tool steel should be used.

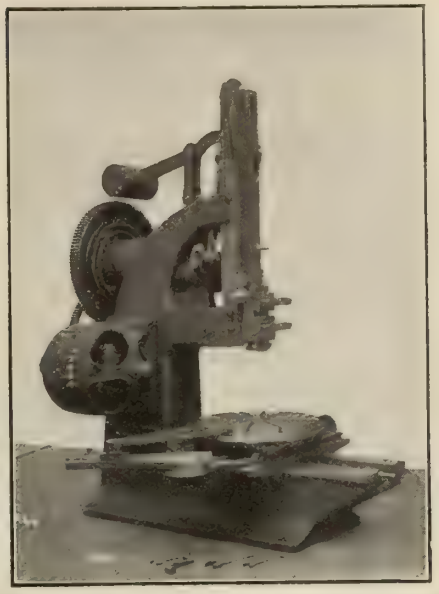


Fig. 23—Slotter Arranged for Machining Links

The feeds are 4 in number, and vary from 3-25ths to 12-25ths of an inch per revolution, which is ample for the work required.

The advantage of this machine is that the power is transmitted entirely through the gear, and bearing has only a steadying action—it has no transmitting function.

The heads are moved backwards and forwards by power which relieves the attendant of much incidental trouble.

The tool post is of a very powerful type, and is operated by large screw of coarse pitch and having differential threads and requiring a minimum of energy and friction.

Double Axle Lathe.

The double axle lathe shown on Fig. 19 is a very heavy and powerful ma-

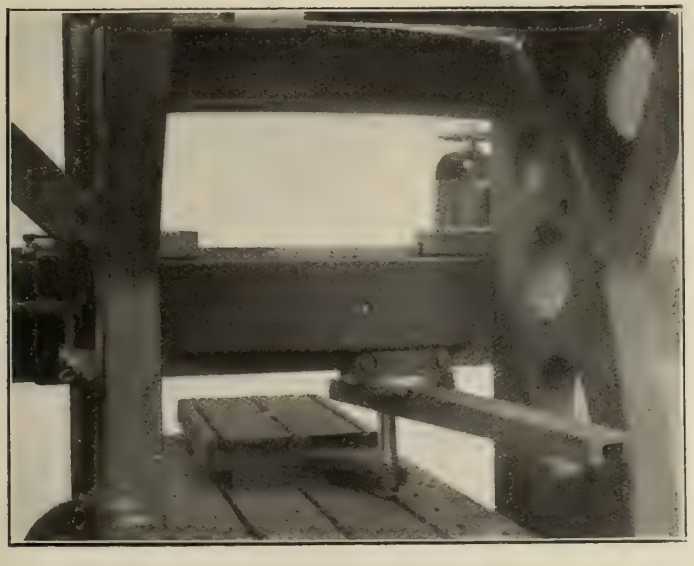


Fig. 24—Machining Links on a Planer.

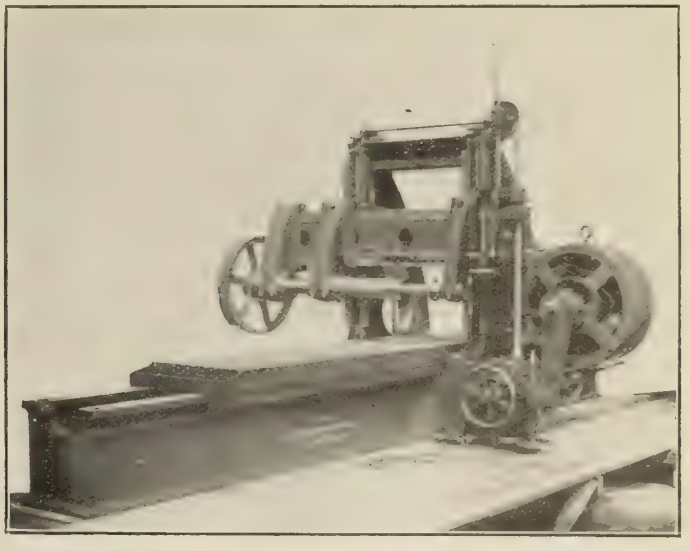


Fig. 25—Horizontal Milling Machine.

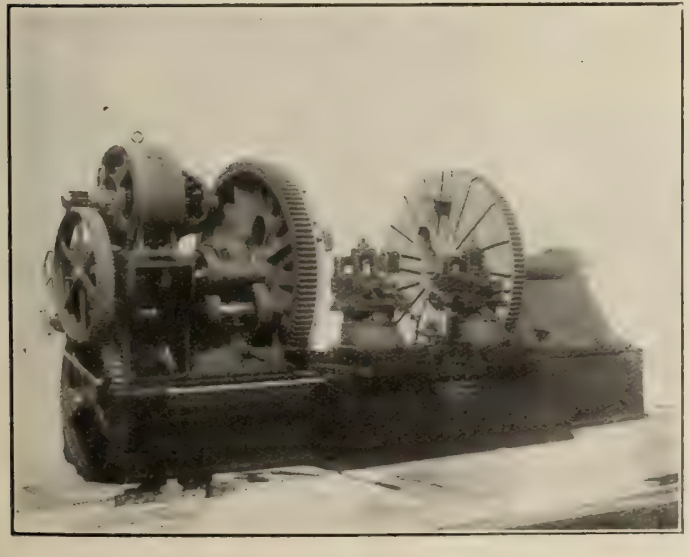


Fig. 26—Driving Wheel Lathe.

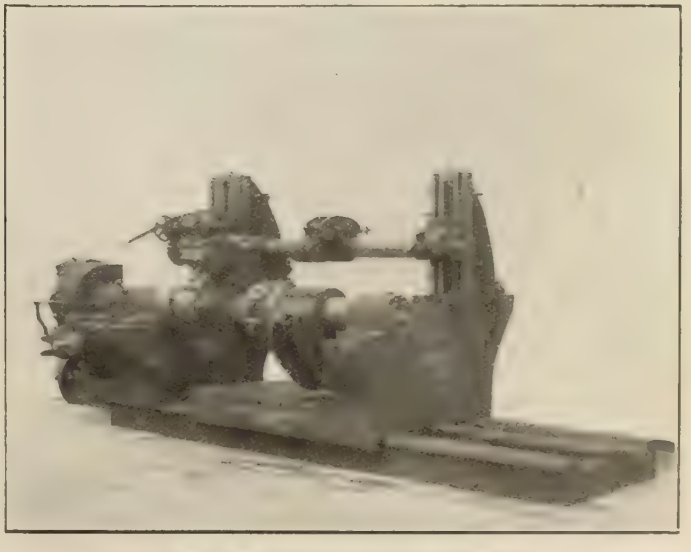


Fig. 28—Cylinder Boring Machine.

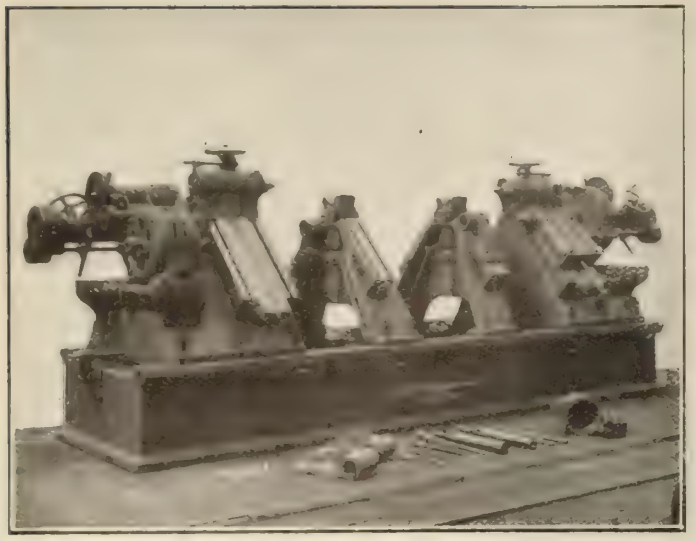


Fig. 29—Bertram Quartering Machine.

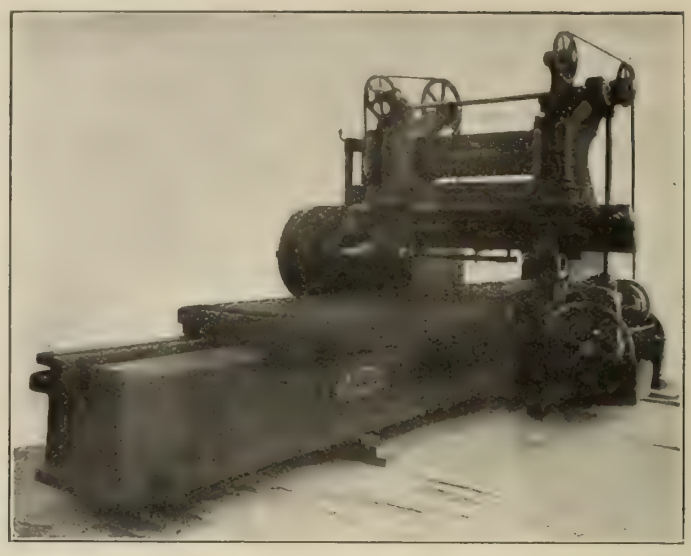


Fig. 30—Newton Horizontal Miller.

chine, designed for the rapid turning of car and locomotive axles.

The carriages are of the double type, having steel gearing and automatic throwout.

There are three changes of feed instantly obtained without stopping the machine. These feeds can be varied within wide range if desired.

The centre driving head has an opening of 13 inch diameter, and is driven by powerful gears of wide face and coarse pitch, and is provided with equalizing drivers.

For motor drive, a variable speed motor having a speed variation of 3 to 1, of from 15 to 30 h.p., depending on the class and quantity of work required, is used. If belt driven this machine is driven by a 6-inch belt, having 3 step cone of large diameter, cone being 24 inches.

Bertram Tools.

Fig. 20 shows a 30 inch double back geared high speed engine lathe, built by John Bertram & Sons Co., Dundas, for use in locomotive work. It admits 15 feet between centres. The swing is 32 inches over shears, and 20½ in. over the carriage. It is equipped with independent rod and screw feeds, power cross-feed, compound rest, plain tool block, quick change screw cutting gear from steel and two steady rests. It is driven by a 10 h.p. motor and has a speed of 400 to 600 r.p.m.

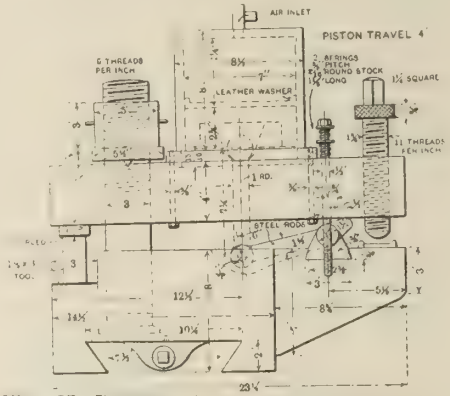


Fig. 27—Peterson Pneumatic Toolholder on Bertram Car Wheel Lathe.

The back gears are on the front of the lathe and are really front gears. It is therefore no longer necessary with such a lathe for a mechanic to turn the tool upside down on the back of the lathe to make a good cut. The front gears act directly on work giving smooth cut. This feature is typical of modern practice.

The two spindle drilling machines shown in Fig. 21 has spindles 3 inch in diameter, with 18½ in. traverse and three changes of speed. The heads are adjustable along the rail by hand or by power. The saddles are adjustable in and out 24 inches. The table is provided with a trough for collecting drill fluid which drains to pump for circulating. The range of spindle speeds is from 20 to 180 r.p.m. Heads and pump are motor driven.

Fig. 22 shows a modern four-head Bertram drilling machine such as used in the modern locomotive shop for drilling locomotive frames. Three heads are used for vertical drilling and one swivels for angular drilling. Power is transmitted to the head by driving shaft the entire length, which in turn is operated by a belted 20 h.p. constant speed motor driven countershaft at the end of the machine. Spindle ends are fitted for No. 5 Morse taper sockets.

Modern Method of Machining Links.

Two plans are adopted for machining reversing links. The Bertram slotter is shown in Fig. 23 and a planer attachment for giving the links the correct curve is shown in Fig. 24. The slotting attachment is used on a 12-inch heavy slotting machine. The table is 30 inch



Fig. 32—Newton Rod Boring Machine.



Fig. 31—Tabor Spiral Inserted Tooth Cutter.

in diameter with 30 in. longitudinal and 24 inch transverse speeds.

When used for slotting links the worm gear is unhitched and the table rotates. The device shown for planing links makes a perfect link. The construction of the jig will be readily seen from the illustration.

Fig. 25 shows a modern horizontal milling machine for milling the channels and plates on side rods. In the machine shown the distance between housings is 40½ in. The maximum distance from centre of spindle to table, 52 ins. Capacity to mill 14 ft. long. The spindle is 5½ ins. in diameter and has four changes of speed, fitted with taper socket 3½ ins. in diameter at its large end.

Bertram Driving Wheel Lathe.

Fig. 26 shows a 100 in. new model Bertram driving wheel lathe with a capacity for 86 inch wheels. The swing over the bed is 102 inches. Maximum distance between centres is 9 ft. Swing over the carriage is 96 inches. On the pedestals are mounted two compound rests with tool blocks fitted with a patent single screw tool holder. The feed mechanism gives four changes of feed to one revolution of drive. Driving pinions are steel cut from the solid. The face plates are provided with pockets, to receive crank pins and each is equipped with four Teas' Patent Sure-grip Drivers.

Tailstock or movable head provided with quick power traverse by 7½ h.p. motor. Carriages are of box construction and extend the full width of the bed so that pedestals carrying tool blocks will have sufficient travel for boring wheel centres. When turning full diameters the rear portion of the saddle is detached which will permit wheels being taken out of the machine without changing the position of the carriage, it being only necessary to remove the tailstock to the rear sufficient to withdraw the crank pins from the faceplate. It is motor driven by a 50 h.p. D.C. variable speed motor 500-100 r.p.m. with a 7½ h.p. A.C. constant speed motor for traversing the head.

The C.P.R. have successfully applied a pneumatic tool, designed by W. Peterson, of the C.P.R., Montreal, to Bertram lathes for turning car and truck wheels. In turning wheel tires it is necessary to change the tools three times for each tire and two men were required to operate the tools. With the tool shown, one man can operate them, the necessary champing and setting being accomplished almost simultaneously.

A two spindle Bertram cylinder boring machine is shown in Fig. 28. It has a bed 19 ft. 7 inch long, 48 inches wide and 10 inches deep on which is an adjustable table 57 inches long, 53 inches wide, having power traverse along the bed. When in working position it supports the outer end of boring bars, and when removed to the end of the bed the cylinder is free of the bars and may be lifted without taking the bars off the machine. The large bar is 12 inches in diameter having horizontal adjustment from 15 inches to 32 inches, and is 24 inches from centre of bar to top of table. The small bar is 5 inches in diameter, with horizontal adjustment of 14⅛ inches, also a vertical adjustment from 9 to 31 inches. Diameter of head on 12 inch bar is 21 inches; diameter of head on 5 inch bar is 11¼ inches. Each bar has three changes of feed. Machine has four facing heads, two for each bar, smallest to face 20 inches in diameter and the largest 44 inches in diameter. It is motor driven by 15 h.p. D.C. 2 to 1 variable speed motor.

Fig. 29 is a 100 inch locomotive driving wheel quartering machine. It has a capacity for wheels up to 90 inches in diameter on the tread, with from 10 to 20 inch stroke. The heads have long bearing on a substantial bed and are adjustable for axles of different lengths. These machines are built for either right or both right and left hand lead. Spindles are of large diameter and have 15 inch traverse. The saddles carrying same are graduated for easy adjustment to the desired stroke. Spindles have three changes of power feed and rapid hand movement. Axles are held on centres and on adjustable "V" bearings supporting by frames to which the wheels are securly clamped. The boring spindles are provided with outboard support and also with device for truing up crank pins. Each head is arranged with motor drive by a 5 h.p. constant speed motor.

Newton Machines.

The horizontal milling machine shown in Fig. 30 was built by The Newton Machine Tool Co., Philadelphia, for the G.T.R. shops, Point St. Charles, and is adapted to the milling of locomotive rods.

Installations of these millers at the Pittsburg works of the American Locomotive Co. show that they are slabbing rods on cuts from 14 to 18 inches wide, ⅜ to ½-inch deep, at a table feed advance of 8 inches per minute, and channeling two rods at one time, each channel being 3½ inches wide and 1¾ inches deep in one operation, at the rate of 2¼ inches to 2½ inches per minute. These results have been accomplished by means of the Tabor helical spiral inserted tooth high speed milling cutter, as shown by Fig. 31. The average removal of metal is equivalent to one cubic inch per minute of horse power.

Fig. 32 illustrates a new design of rod boring machine, with the additional adjustable support for the end of the spindles; when supported in this manner a cup cutter is used to trepan the rods. This view was taken in the Juniata shops of the Pennsylvania Railroad, and results show that 10½ inch diameter bores are made in rods 5-inch thick, in twenty (20) minutes, for which only a reaming cutter is necessary to finish. This method eliminates the necessity of drilling a pilot hole. Both holes are finished at the same time.

Cut Time Between Cuts.

In a recent address on shop efficiency given by E. P. Bullard, president of the Bullard Machine Tool Co., Bridgeport, Conn., he summed up the problem of reducing shop costs in the following terse sentence. "To cut shop costs, cut the time between cuts."

As an example of the inefficiency resulting from not cutting time between cuts, he pointed out that in a prominent shop, after a difficult piece of work had been finished on a boring mill, it was necessary to wait from 10 a.m. to 3 p.m. before a new forging was available, the machine in the meantime lying idle. He also pointed out that a great deal of time is wasted in boring mill operations in adjusting the machine to the exact size required by the work and stated that a considerable time can be saved on machines equipped with micrometer dials which permit instant and accurate adjustment.

W. R. Towne, president of the Yale & Towne Co., Stamford, Conn., states that by the use of scientific methods and automatic machinery, his company, within the past six years, had achieved increased output, decreased labor cost and increased wages to employes.

In speaking with a superintendent of a large Hamilton plant recently he stated "Deliver tools to the men. Keep men busy. More time is lost in men looking for work than in actual production." In the G.T.R. shops, Stratford, this has been recognized, and in order that men may be kept busy, chasers have been appointed to keep the men supplied with the work. At first the men looked on the innovation with disfavor, but now they keep the chaser busy with requests for more work.

With the development in machine tools and improved methods between operations, greater shop production is made possible. The foregoing by no means exhausts modern practice, but it points out a number of main features and describes a number of interesting tools now found in the machine shop. Various attachments and special machines have also been devised. Perfection is a hard thing to obtain, but manufacturers of machine tools, master mechanics, shop foremen and managers are on the right track, and with the progress that is being made it may not be very long before still greater outputs will be possible.

Experiments on Water Discharge from Short Nozzles

By James Barr, B.Sc., and George Fax *

The Results of a Series of Tests Conducted at the Canada Foundry Co., Toronto, by George Fax, Have Been Taken up by James Barr, and Some Very Instructive Inferences Drawn Therefrom. While the Treatment of the Subject is Largely Mathematical, the Forceful Manner in Which it is Placed Before the Reader Simplifies any Difficulties That Might Otherwise Arise. The Mathematical Deductions Involved are Such as Arise in the Routine of Every Engineer who Attempts to Understand his Indicator Cards. In Addition, it Might be Said That the Advent of Water Wheels in Such Large Numbers Makes This Article Doubly Interesting as Adding to the Fund of Useful Hydraulic Information.

IF we have two variable quantities (x and y) connected by an equation of the form $y=Ax^n$, where A and n are numerical constants, we shall obtain a straight line if we plot a graph showing the logarithms of x and y; and from the position and slope of this line we can readily find the values of A and n.

This device is often of great practical service, not only in obtaining the values of A and n, but also in showing graphically the true relation between the varying quantities x and y, since the straight line can often be easily and accurately drawn.

For example, it is generally supposed that if D be the discharge from an orifice, and H the head or pressure at the orifice $D=A H^n$ where A and n have approximately constant values.

Deductions.

The accompanying table and diagram indicate the method of plotting the results and deducing the equations.

Let D be the discharge in Imperial gallons per minute and H the head or pressure at the nozzle in pds. per sq. inch. We see from the table that the values of D range from 37 to 364, and therefore log D varies from log 37 (=1.568) to log 364 (=2.561). The values of H range from 30 to 200, and therefore log H varies from log 30 (=1.477) to log 206 (=2.300).

We accordingly lay off a horizontal scale ranging from 1.5 to 2.6 and a vertical scale ranging from 1.4 to 2.3. We can now readily construct logarithmic scales of D and H. The log of 100 is 2, so the value 100 (of D or H) will appear opposite the point 2 in our scales. Similarly log 140=2.146 and the value 140 will, therefore, appear at the point 2.146 on our scales. In this way we find as many points as we deem sufficient to complete the scales. The experimental results are now plotted in the usual fashion. For instance, at a pressure of 100 lbs. per sq. inch, the ¾ in. nozzle was found to discharge 121 gallons per minute. Through the point 100 on the H scale we draw a horizontal line to meet a vertical line through the point 121 on the D scale, and the point of intersection P, is a point on the curve for the ¾ in. nozzle.

When all the points are plotted the nearest straight lines are drawn through them. The equation to each of the straight lines is deduced in the following way:

If $D=A H^n$

$\log D=\log A+n \log H$.

Log A is a constant quantity and n is, in the diagram, the tangent of the angle which the line makes with the vertical axis. Considering point P

$$n=\frac{PQ}{QR}=\frac{7.8}{15.6}=\frac{1}{2};$$

log D=2.083; and H=2; therefore we have from the equation,

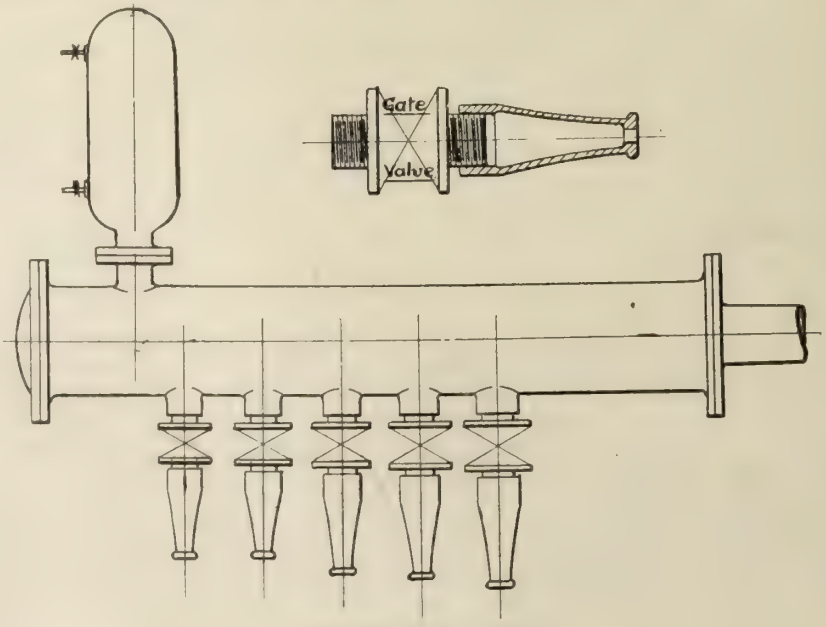
$\log D=\log A+n \log H$;

$2.083=\log A+\frac{1}{2}\times 2$; or

$\log A=1.083$; therefore

$A=12.1$.

Therefore, $D=12.1 H^{\frac{1}{2}}$ is, very approximately, the equation to the line.



Apparatus Used in Test.

For any value of H, within the limits of the line, we can find D from this equation,

If H=166;

$D=12.1\sqrt{166}=12.1\times 12.9=156$.

which is the value given by the graph.

In the equations given in the diagram, D is the discharge in Imperial gallons per minute, and H is the head at the orifice in pds. per sq. inch. The diagram also shows a scale of discharge in U. S. gallons per minute, and a scale of heads in feet of water. These are easily constructed as follows:

Taking N. Imp. gall.=(1.2N) U.S. gal.=M. U. S. gal., we have log M=log 1.2+log N.=0.079+log N.

Therefore, if, on our logarithmic scale of Imp. gallons we add to any value N a distance equal to 0.079 on our scale of logarithmic we shall arrive at the corresponding value M of U. S. gallons. For example, if N be 100 in Imp. gal., we see this number is at 2.0 on our original scale of logarithms, and opposite the reading 2.079 on the scale we find 120, which is the corresponding value M in U. S. gals. In other words, the U. S. gal. scale is obtained by moving the Imp. gal. scale forward through a distance 0.079 on our scale of logarithms. This has been done on the diagram by moving the scale this distance to the left, and placing it at the top of the diagram, to avoid confusion. It will be seen that 120 on the U. S. scale is vertically above 100 on the Imperial scale.

*Designers with the John Inglis Co. Toronto.

Similarly, if we take 1 lb. per sq. inch to be equivalent to a head of 2.31 feet of water, the 'feet' scale is obtained by lowering the lbs. per sq. inch scale through a distance=log 2.31 (i.e. 0.367) on the scale of logarithms.

Apparatus and Experiment.

The arrangement of the apparatus and the type of nozzle are shown in drawing. The nozzles were arranged in order of size in a row upon a 10 in. diam. horizontal pipe; the largest nozzle was towards the supply end, and an air vessel was provided at the closed end. Each nozzle was isolated by a gate valve with a clear bore of area not less than five times that of the nozzle, and the length of the parrallel bore at the outlet of each nozzle was at least equal to the diameter of the nozzle.

The water was delivered to the 10 in. main by means of a plunger pump, and was measured by counting the revolutions of the pump; a correction being made for slip at each pressure. The slip was measured by shutting down the discharge valve and driving the pump to keep the required pressure constant. For example, if the pump was driven at 50 r.p.m. to maintain a pressure of 100 pds. per sq. inch during an experiment, and if, when the discharge valve was closed the pump had to make one r.p.m. to keep the pressure at 100 pds. per sq. inch, then the slip was taken as 1 in 50 or 2 per cent. Precautions were taken to have fairly steady conditions before taking any readings.

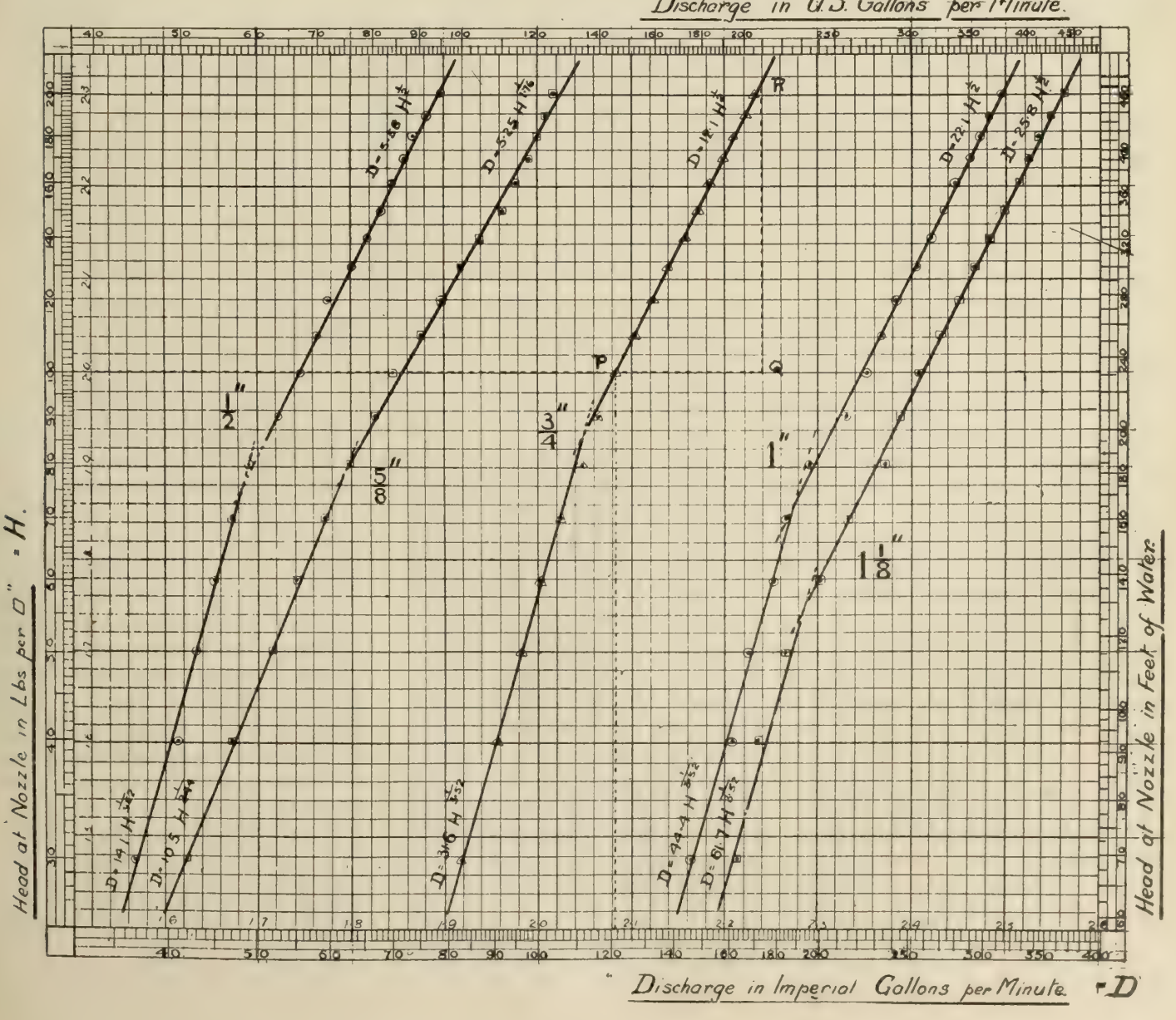
Conclusions.

All the nozzles were 'ringed,' i.e., they had an inside shoulder as shown in drawing, except the $\frac{5}{8}$ inch nozzle which was made from the $\frac{1}{2}$ inch pattern by boring away the ring, and which was therefore a smooth nozzle. This probably accounts for the fact of the discharge being relatively greater in the case of this nozzle, as the restriction of the flow would be less than in the others. The diagram shows this greater discharge very clearly by the altered slope of the curve.

That all the points should lie so nearly upon straight lines, and that these lines should be parallel for similar nozzles, would indicate that the method of measuring the discharge, adopted in making the experiments, was a reliable one.

It is at once evident from the diagram that each curve consists of two distinct portions, indicating two laws of resistance to the flow of the water. Up to the bend in the curve the resistance follows a definite law, but at the bend a velocity is reached at which the resistance becomes less, and it continues to be less, according to a new definite law, throughout the higher velocities.

It is supposed that this change in the law of resistance was due to the proximity of the gate valve to the orifice. The gate valve was equivalent to a sudden enlargement in the area of the pipe section and this would cause additional eddies and increase the resistance to the



flow at the lower velocities. It is however conceivable that a certain velocity would be reached at which the water would shoot past the valve so quickly that it would not be sensibly affected by the enlargement; the latter would cease to produce a noticeable increase in the resistance, and this would obtain for all higher velocities.

It is therefore concluded that the results given in the table and diagram admit of practical application only under circumstances where the conditions of experiment are approximately obtained with regard to the position of the nozzle with reference to the gate valve.

The object of the above experiments was the calibration of an apparatus for the testing of centrifugal pumps.

Discharge from short nozzles, in Imperial and U.S. gallons, per minute.

	Pressure at nozle—lbs.									1 Imp. equals
Size of nozzle	30	40	50	60	70	80	90	100	110	1.2 U.S.
½-in.	44	49	51	54	57	59	64	68	70	U.S.
do	37	41	43	45	47	49	53	56	58	Imp
⅝-in.	50	56	62	66	71	76	80	84	90	U.S.
do	42	47	52	55	59	63	67	70	75	Imp
¾-in.	100	110	115	121	127	135	139	145	153	U.S.
do	83	91	96	101	106	112	116	121	127	Imp
1-in	175	195	202	215	222	235	256	270	280	U.S.
do	146	162	168	179	185	196	214	225	234	Imp
1⅛-in	195	207	220	242	258	282	293	308	324	U.S.
do	163	172	184	201	215	235	245	256	270	Imp

	Pressure at nozzle—lbs.									
Size of nozzle.	120	130	140	150	160	170	180	190	200	
½-in.	72	76	79	82	84	87	89	91	95	U.S.
do	60	63	66	68	70	72	74	76	79	Imp
⅝-in	95	100	105	110	114	118	120	123	125	U.S.
do.	79	83	87	92	95	98	100	102	104	Imp
¾-in	160	166	173	178	184	189	194	199	204	U.S.
do	133	138	144	148	153	158	162	166	170	Imp
1-in	290	305	315	325	335	347	355	363	375	U.S.
do	242	255	264	272	280	290	296	303	313	Imp
1⅛-in	338	351	364	377	391	401	411	423	437	U.S.
do	282	293	304	315	326	334	343	353	364	Imp

A Day's Ramble Through the M.C.R. Shops at St. Thomas

By Fred. H. Moody

Every Shop has its Ways and Means of Meeting Exigiencies That Arise in the Shape of Unusual or New Jobs, but the Railway Repair Shop has an Exceptionally Large Number of Such Special Tools. The M. C. R. Shops, Under the Direction of an able Staff of Men, have Developed Numerous Special Methods and Devices, a Number of Which Were Picked up by the Writer in a Recent Trip Through the Shops, and are Here Given with Some Detail, as They Will Doubtless Prove Beneficial to Machinists, in General, in Developing Initiative for Undertaking New Jobs.

PART II.

Boiler Shop.

Coming to the boiler shop, a number of special tools are to be found, a few of which will be described. Fig. 10 shows a holding-on tool that has several unique features. It will be noticed that it can be used close in against any side sheet by using the outer holding-on bar. The device consists of a piece of heavy wrought iron pipe A bored as shown. There are two covers BB screwed on, the top one having openings. Inside is the piston C built up as indicated, with a leather packing ring. From this piston, extend two rods, D and E, of which D is centrally located, and E, offset. Normally D is used, but where the rivets are up close to a side, as for example the rivets between the boiler shell and head, the die on E is made use of. Air is introduced by the usual air valve and hose, below the piston C, forcing the desired die against the rivet head. As will be noticed, the dies on the heads of D and E may be replaced with others to suit the rivet in hand.

Another holding on tool is shown in Fig. 11, and is one that is only employed where the clearance space above the rivet is small, as in the water leg, where the working space is never over 4 or 5 inches. The usual method of doing this work is by a cup and wedge bar, a rather inconvenient method. The holding on block under discussion, is loosely suspended in the water leg by a wire through hole A. The hot rivet is placed in its hole, and the bevelled edge B placed against its head. A drift pin is then shoved through a stay bolt hole from the firebox, and engages with either one of holes CC. Pressure from the firebox on the drift pin, holds this bevelled face B tight over the rivet, which can be riveted from the outside of the boiler. While apparently a rather unstable arrangement, the results from its use are excellent, and besides, it is much more convenient than the before mentioned customary method of cup and wedge bar.

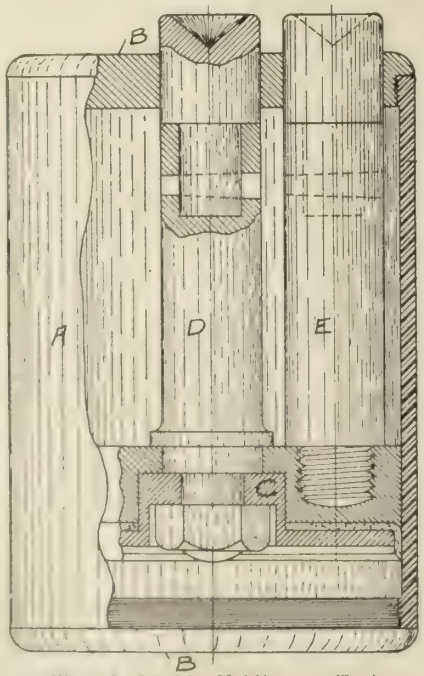


Fig. 10—Double Holding-on Tool.

The stay bolt socket, Fig. 12, is unique in that it is equally good for driving in, or removing stay bolts. As can be seen, it consists of a tool steel engaging piece A in a soft steel shell B to fit an air drill. The two are keyed at C. The engaging piece A has tapered flutes like an external reamer, only the halves are symmetrically the same, one half being effective in screwing in the stay-bolts, and the other half in the removing operation. The taper makes the grip very positive. When A is worn out, the part B is still useful for a new grip.

Continuing on the subject of stay-bolts there are several original ideas in use at these shops. For example, a new type of stay bolt tap is extensively used. It is believed, and justly too, that the usual stay bolt tap, reams the hole much

larger than it should be before the tap takes a grip and a thread begun. The tap used here is short, and straight up to within an inch and a half, or so, from the end, when. instead of being ground

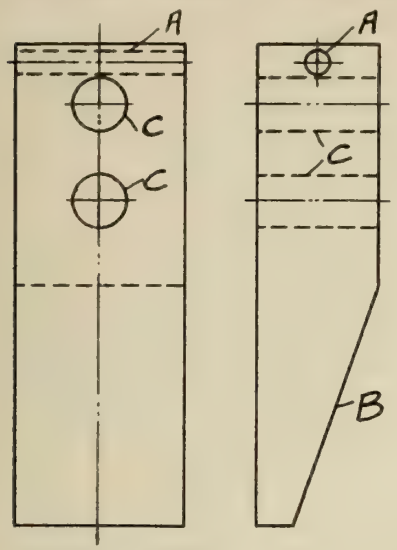


Fig. 11—Holding-on Block.

down the thread is cut on the taper. Thus, there is always a full thread, the tips being, of course, smaller in diameter. The full thread always grips without slipping, and reaming the hole. While more expensive, the extra cost is warranted by the superiority of the work.

Carrying out this same principle, they have a good way of tapping for radial stay-bolts. A hollow tap of the form just mentioned, is slipped over the reduced end of a round bar, the latter slightly smaller than the punched holes. This act as a guide for the tapping operation through the outer sheet, when a similar operation is performed from the inside, through the inner sheet, the rod guiding in the inner and outer sheets in each operation, respectively.

Blacksmith Shop.

Fig. 13 shows an anvil used in the smith shop for forging tapers on rods or bars. It is essentially the usual steam hammer anvil, with an inserted circular piece A. This piece can be moved around to make its upper face at any angle with the face of the stationary part. Bevels can thereby be forged very expeditiously. The arrangement is so simple, further explanation is unnecessary.

The springs under the locomotive, are built up of a number of strips of spring steel of varying length, with a collar around the whole to band them together. Fig. 14 shows a press employed in this banding operation. It consists of an old air compressor cylinder A, and a forging B. On the end of the air piston rod is a head C. The pile of component parts of the spring are placed on this head, located centrally. Air pressure in A lifts the pile against the projecting arm of B, compressing them together snugly. A clamp is then placed over this com-

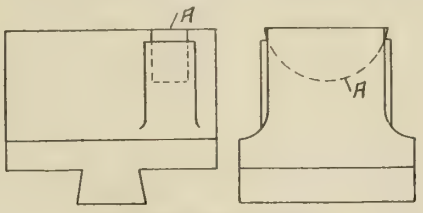


Fig. 13—Taper Anvil.

pressed bundle just off centre. The pressure is then relieved, and the spring removed. The clamp being to one side leaves the centre free to have the retaining band shrunk on. The usual method of banding, is to put a large collar over the bundle, and compress by driving a wedge in between the large collar and

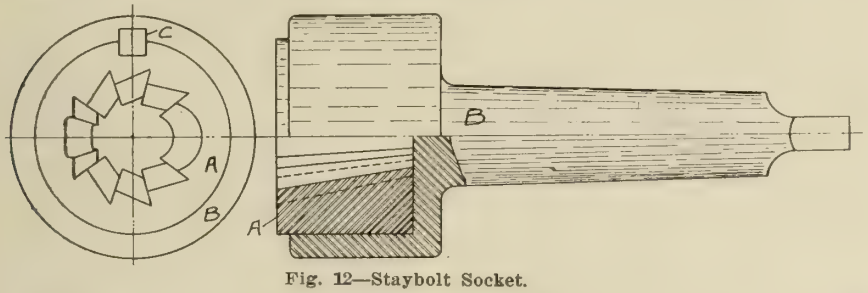


Fig. 12—Staybolt Socket.

the springs, after which the retaining band is shrunk on. The method described is much more expeditious, and allows of no error in adjustment.

A large variety of work is handled in the car repair department, giving a wide range of appliances. The most interesting operations are those on the bulldozer, where a number of special dies have been prepared. Such parts as the car sill, step and coupler pocket, are made in a very simple manner, the former in one operation, and the latter in three.

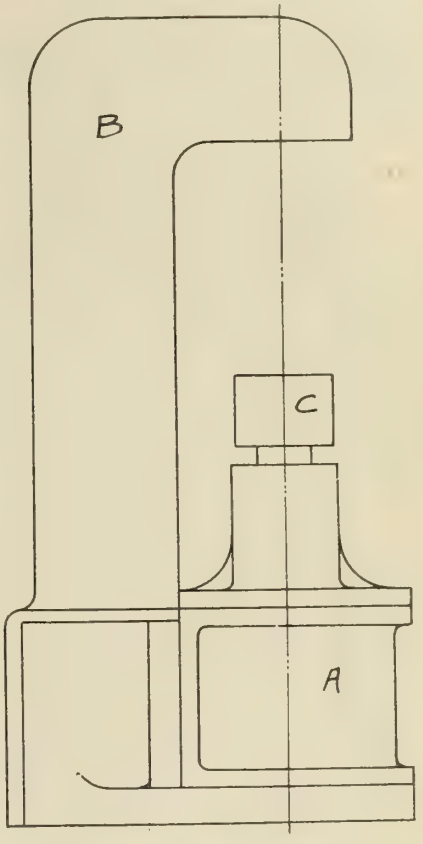


Fig. 14—Spring Press.

Fig. 15 shows a neat bending device for making eye bolts. The piece to be bent is placed against the angle A and clamped there by eccentric B. The roller C on arm D, which has previously been swung around behind the bar to be bent, is swung around in the opposite direction, bending the bar around the centre pin E. The distance between pin E and roller C is the thickness of the stock to be bent. This distance can be

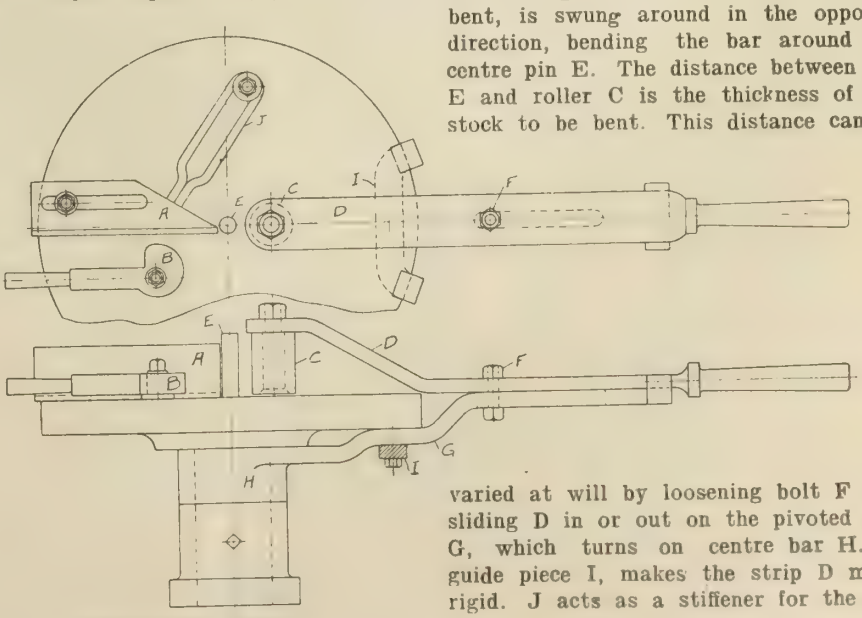


Fig. 15—Eye Bender.

varied at will by loosening bolt F and sliding D in or out on the pivoted bar G, which turns on centre bar H. A guide piece I, makes the strip D more rigid. J acts as a stiffener for the an-

gle A which can be adjusted to suit the work, as it is slotted as shown.

The punch press in the car shop has

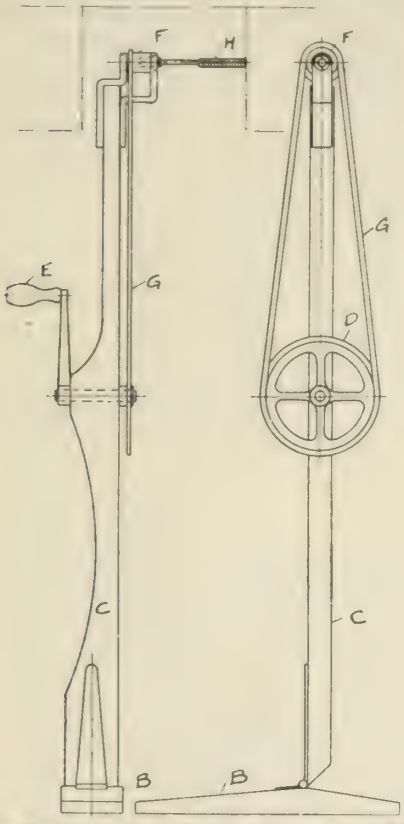


Fig. 16—Wood Drill for use between Car Sills

a spacer for spacing rivet holes in plates or bars. The spacer consists of a long piece of metal with a groove, through which bolts are secured. The upper end of the bolt is so made as to fit the size of hole being punched. Being adjustable, it can be set to engage with a punched hole the proper distance from the hole to be punched, thereby properly spacing the holes.

Fig. 16 shows a home-made drill for drilling in the confined space between the sills of cars. AA are car sills, in which holes are to be drilled. The device consists of a wooden base B to which an upright wooden arm C is hinged. On C is an old bicycle sprocket D with handle E. D drives a smaller sprocket F through chain G. Sprocket F has a square recess to hold the wood bit H. The method of operating is self-explanatory.

In the car shop, repairs were being made to the cement floor, which had holes in places. A composition of cement and cast iron chips, a mixture frequently employed, was being used, the results proving very satisfactory, the mixture forming a hard, wear-resisting surface.

Round House.

For removing the locomotive drivers, sections of the rail over the pit must be removable to allow of the wheel dropping. The arched rail used by the M. C.R. is shown in Fig. 17. The customary method of bracing this removable section, is to put a heavy casting under the rail, making the removable section very unwieldly. The method shown makes for a lighter construction.

The jack for lowering the locomotive drivers, is also shown in Fig. 17. It is of the telescope construction, allowing of a more compact arrangement, much shallower than the straight lift type would permit. The sleeves slide past each other, the whole being actuated by compressed air. The jack is on a small truck, which moves lengthwise on a larger truck, the latter having a track long enough to run outside and clear the locomotive rails. This is to permit of lifting the drivers completely away from the locomotive for repairs. The whole construction is clearly shown by the cut.

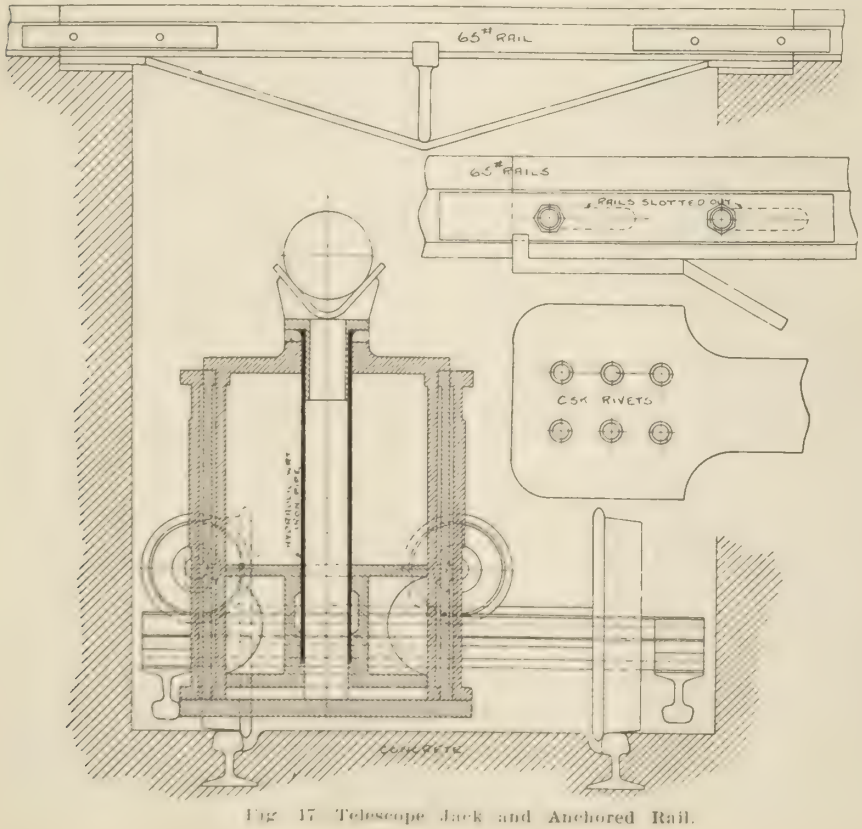


Fig. 17 Telescope Jack and Anchored Rail.

COBALT-CHROMIUM ALLOY.

Stellite is the name of a Cobalt chromium alloy which has been discovered by Elwood Haynes. It can be made into cutting tools which meet all the requirements of ordinary use and will not tarnish or rust. The inventor has tested the new alloy in many forms, having used it in razor blades and in lathe tools for cutting steel at a high rate of speed. The razor blades, although taking a satisfactory edge, were acknowledged inferior to steel razors on account of requiring more frequent stropping, but for many tools the alloy was found superior to steel.

Notwithstanding the great hardness of the alloy, it not only forges readily at a red heat, but can be bent at a right angle cold, either in the form of a cast or forged bar, provided the dimensions do not exceed one-fourth inch square. Its elastic limit is not quite equal to that of tool steel of the same hardness, but it is much tougher. In color the metal stands between silver and steel, and if suitably polished shows a high lustre. Many experiments were made before an alloy could be produced that would forge out perfectly into thin strips, and shows no tendency to check. After cooling, these strips are as hard as mild-tempered steel, and can scarcely be scratched by a file. A kitchen knife blade was made from this material, and after two years of use showed not the faintest sign of tarnishing. If held in the sun it produced a reflection that would dazzle the eye.

A lathe tool test was made against high speed steel, and it was found that the stellite tool would cut a continuous shaving from the bar at the speed of two hundred feet per minute, while the high speed alloy steel tools failed almost instantly. It does not follow from this that the alloy is better suited for high speed lathe tools than good alloy steel, but simply that it will stand a higher speed without softening. It would not be reasonable to expect a revolution in tool-making on account of this discovery. There is in the new alloy a possible outlet for the great Cobalt production of Ontario's silver mines. This gives the matter special interest in Ontario at the present time.

MACHINE SHOP METHODS AND DEVICES

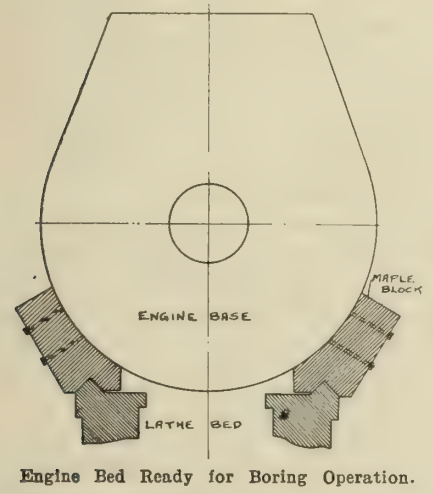
Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

LARGE JOB IN SMALL SHOP.

By Frank E. Booth.

The job in question was the boring out of the five bearing boxes of a four cylinder vertical internal combustion engine.

The only machine available for the job was a Bertram lathe having 16 inches swing between the centre and the ways, with a distance of 8 ft. between centres. The engine base was about 6 ft. 6 in. long,



Engine Bed Ready for Boring Operation.

while the longest bearing was 8 inches.

The job was bolted firmly to the lathe carriage at one end, while the other end was supported by two hardwood blocks bolted to the engine base, and fitted to the lathe ways as shown in the sketch. A solid boring bar, with a head for carrying the tool, was used, and the head was shifted from one box to the other as the job progressed. A first class job was the result.

CRANK SHAFT JIG.

In the shops of the Canada Gas Power and Producer Co., Barrie, Ont., there is a very convenient form of jig in use for turning the crank pin of the solid crank shafts used in the Weber engines built by that concern. This method of machining is due to E. J. Graves, superintendent of the plant.

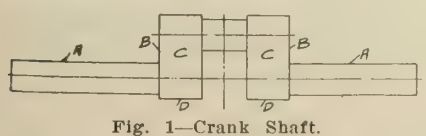


Fig. 1—Crank Shaft.

The chuck or face plate of the lathe is removed, and the jig which is threaded at A to correspond to the lathe spindle, is screwed on. Either end A of the crank shaft is then inserted into hole B of the jig, so that the face B of the shaft is flush with face C of the jig. The offset C of the crank sets into recess D of the jig, and set screws E can be adjusted to centralize the crank pin. The clamping screws F are then

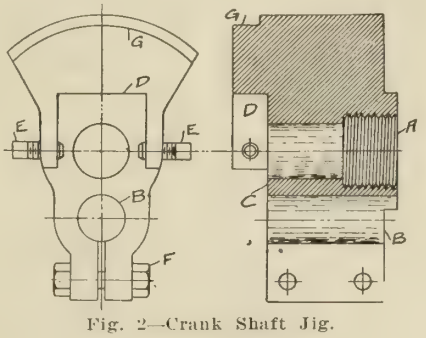


Fig. 2—Crank Shaft Jig.

tightened and the crank pin is ready to turn.

Of course, different sizes of jigs are required for the various kinds of shafts produced. Each jig has another feature of interest. The radius of the contour G of the jig is made the proper radius of the edge D of the crank shaft, from the crank pin centre, so that the tool is quickly set to reduce the shaft to the proper size.

CUTTING LONG LEAD SCREW.

Cutting a 41 ft. lead screw in a shop where the longest lathe is 22 ft. presents a problem. But this was recently overcome in the works of the John Bertram & Sons Co., Dundas. A still more difficult act was the cutting of a 45 ft. lead screw, more than double the length of the lathe on this same lathe.

The first lead screw referred to is, to be exact, 40 ft. 10¼ ins. long, 2 in. pitch, double thread and 4⅛ in. diameter. The screw was mounted in the lathe with outward bearings set up for the overhang. The thread was cut half way along the leadscrew, reversed, and the other half cut.

In cutting the 45 ft. lead screw, it was made in three equal parts. The centre piece had the screw cut on it, leaving a short piece not cut at each end. The two other parts were then welded on, one on each end. The screw was then mounted and a procedure similar to that already described followed.

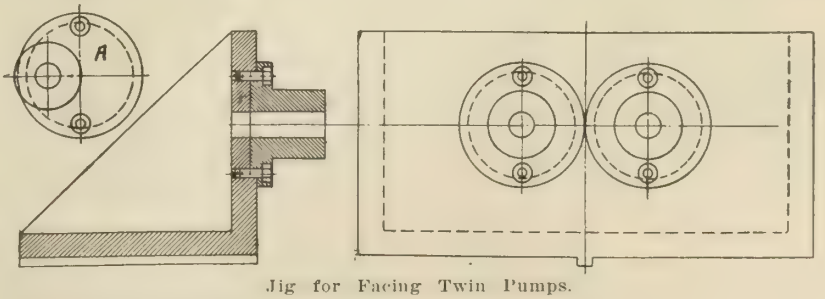
In connection with cutting lead screws, the John Bertram & Sons Co. keep master lead screws, absolutely accurate, and periodically lead screws on the lathes in the shop are renewed to conform with the master lead screw. In this way accurate lathe work in the production of machine tools is assured. It is of interest that the lathe with a 22-ft. bed mentioned above, was built by the John Bertram & Sons Co. and was used by Henry Bertram, the present general manager, to cut lead screws in 1875.

JIG FOR FACING TWIN PUMPS.

One of the principal products of the Canada Foundry Co., is feed pumps for varied uses. To facilitate rapid production, many useful devices in the form of jigs, special machines, etc., are employed. One of the most interesting of these jigs, is the one shown in the accompanying sketch, which is used for machining the valve face, motion bracket, and body of the steam cylinder and stretcher, all at one setting.

The device consists essentially of two cast iron angle plates, to which are attached removable collars. The bore of the cylinder just fits over the collar at one end, and the collars on the other angle plate, fit into the ends of the cylinder stretchers.

As shown the jig will only apply to one spacing of cylinders, that is, for a given distance apart of centres, but, by the use of eccentric collars as shown at A, any distance apart may be handled by the use of the proper collars. As the company uses it, the jig is made for 5 inch centres, with eccentrics for 7½ inch centres.



Jig for Facing Twin Pumps.

HIGH SPEED CUTTER.

John Bertram & Sons Co., Dundas, cut a large number of steel gears from the solid. In machining them and cutting the gear teeth great difficulty was encountered in securing cutters to stand up to the work. After some experimenting, however, a cutter was designed with each tooth tapered from the nose towards the centre of the cutter. With such a cutter a speed of 120 ft. per min. is maintained and 50 per cent. of the time is saved. This is attributed to the relieving of the teeth on the sides.

PITCH OF PROPELLER.

In the November issue of Canadian Machinery, R. Ewart Cleaton gave an article on "Practical Method of Obtaining Pitch of Propeller." We find, however, that the printers have made a serious error in Simpson's Rule which should read as follows:—

$$a = \frac{y}{3}(E + 4S + 2m)$$

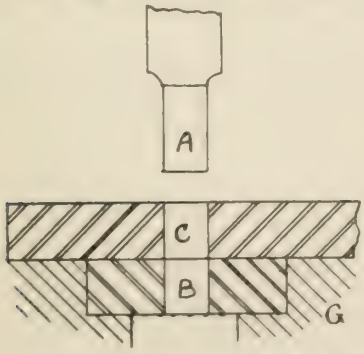
Where a = Area in square inches.
y = Distance between ordinates.
E = Sum of extreme ordinates.
S = Sum of even ordinates.
m = Sum of odd ordinates.

ECONOMIC PUNCHING.

By K. Campbell.

There were a great many bars to be machined in the plant where I served my apprenticeship. These were about 2½ in. by ½ in., and had from 15 to 20 holes drilled in each. This cost 6 or 8 cents each, and they were then countersunk at a cost of 2 or 3 cents each additional. High speed steels were then introduced, making the cost less than this, yet allowing the drill operator to make a slightly larger amount per day.

It was then found that more of these were needed, and unless some means were devised, additional drills would have to be installed. It was finally decided to punch them, and the bars were then punched one hole at a time. This put the idea into the management of punching all the holes at once. As there was other work that could be done economically on a big punch, it was decided to instal one. This was done, and all the holes were punched at once. In Fig. 1, A is the punch, C the work, and B the die, G representing the machine frame.



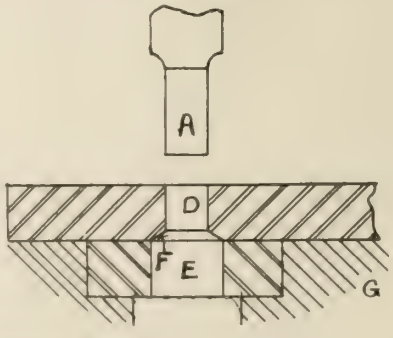


Fig. 1.—Economic Punching. Fig. 2.

The bars were finished much more quickly, but they still required to be taken to the drills to be countersunk until the method shown in Fig. was adopted. A is the punch, B is the work when completed, F shows the countersunk bar, E the hardened die, and G representing the punch frame. It will be noted that the die is the diameter of the countersink. In this way the second handling of the bars was done away with, and the work done very cheaply.

Another job that was done on this large multiple punch was the work on binder bottoms. Formerly these were done on a single punch. The steel bottoms were fastened to the template with steel bushings, the whole being on a large table with handles at each end. Two men operated the table and one the punch. The job was one of the most hated in the shop, and there was rejoicing when dies were made for the multiple punch to allow it being done on that machine. It made a big saving for the company, but incidentally it eliminated the days of hard, heavy lifting of the table, bottom and template, which had to be done for each hole punched, there being 50 or 60 in each binder bottom. These holes were of three different sizes which necessitated handling them three times.

TOGGLE JOINT ACTION.

The toggle joint is used on various machines, such as rock crushers, presses for stamping sheet metal, etc. The two accompanying line drawings show the application of the toggle joint to a press. Referring to these, A is a crank keyed to the main crank-shaft of the press. Connecting-rod E, attached to this, is pivoted in yoke H, which is suspended on rocker arms F and G, pivoted to the side frames of the machine, on opposite sides of H. Bell crank levers D are operated from the center pivot of H, through short links J. Links C connect the upper arms of bell cranks D with cranks B, which are keyed to rocker arm shafts.

A comparison of the two illustrations will show the action of the mechanism. In Fig. 1, crank A is at its highest position. In Fig. 2, the blank holder is down. It will be seen that in this position bell cranks D and links C are straightened out, so that a powerful

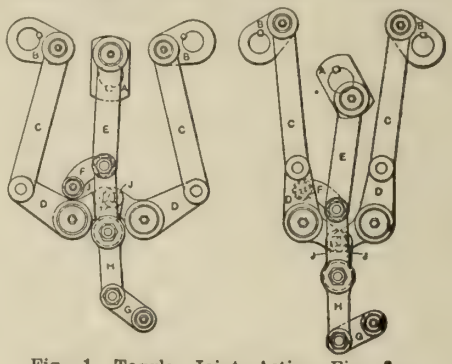


Fig. 1.—Toggle Joint Action—Fig. 2.—

toggle action with an appropriate dwell is obtained, lasting through a considerable portion of the revolution of the crank-shaft.

Cranks B, in turn, operate the rocker arms, which, with the links connecting them with the blank holder slide form a second toggle joint mechanism. It will be seen that these two sets or toggle joints, acting in series as they do, give a powerful pressure to the blank holder, estimated at 2,000 tons.

SAVING SHEET METAL.

In stamping sheet metal, it is possible to waste a lot of metal. Fig. 1 shows a method of stamping out washers where there is a large amount of waste. It will be evident from Fig. 2 that by stag-

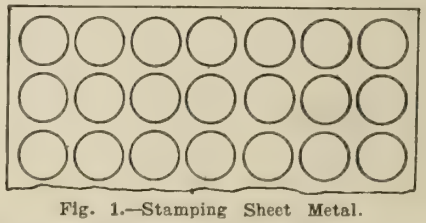


Fig. 1.—Stamping Sheet Metal.

gering the rows or cutting them zig-zag, more washers can be cut out of a sheet of metal. The E. W. Bliss Co., manu-

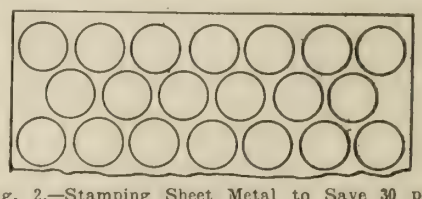


Fig. 2.—Stamping Sheet Metal to Save 30 per Cent.

facturers of presses, have estimated this saving at from 5 to 30 per cent.

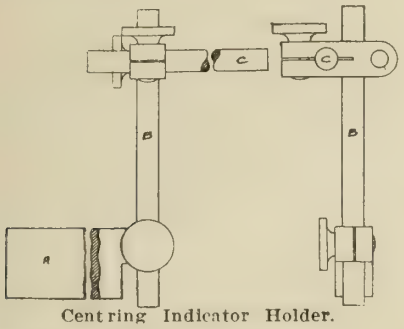
By making the cuts touch each other as much as possible, it is possible to secure the maximum economy in stamping out washers. In order that the centre of

the washer be not wasted, these can be used for making smaller washers.

CENTRING INDICATOR HOLDER.

This is a simple little device used in the tool-room of the London Machine Tool Co., Hamilton, for carrying the Starret Indicator No. 64. It was designed by the foreman toolmaker with the object of greater flexibility in getting at unhandy centres, as by this device, the connecting arms make any position of the indicator practically possible.

A is held in the tool post of the



Centring Indicator Holder.

lathe, while the indicator is attached to arm C, the intervening arm B being used to increase the range. A is a piece of machinery steel, and rods B and C are of stub steel, requiring no extra finish. The joint between B and C is cast steel, slit at the ends to facilitate clamping, making in all a very simple and useful device. Tool-makers and machinists will find this a useful addition to their outfits, and it requires very little time or exertion to make.

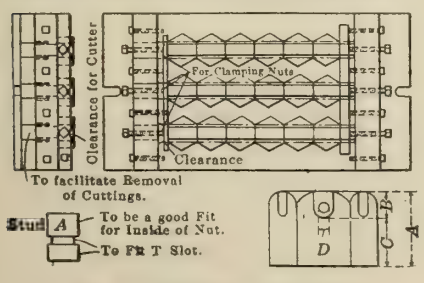
JIG FOR HOLDING CASTLE NUTS WHILE CUTTING SLOTS.

By G. C. White.

In the works of the C.P.R. at Montreal, a jig similar to the one shown in the cut is used for holding nuts so that

Diameter of Bolt	A	B	C	D	Width across Flats *
⅜"	1¼"	5/16"	11/16"	¼"	1 7/16"
½"	1¼"	5/16"	1 3/16"	¼"	1 5/8"
1¼"	1⅜"	½"	⅞"	5/16"	1 11/16"
1¼"	1½"	½"	1"	5/16"	2"
1⅜"	1⅝"	½"	1⅛"	5/16"	2 1/16"
1½"	1¾"	½"	1¼"	5/16"	2⅜"

* These are the only Dimension for the Unfinished Nut.



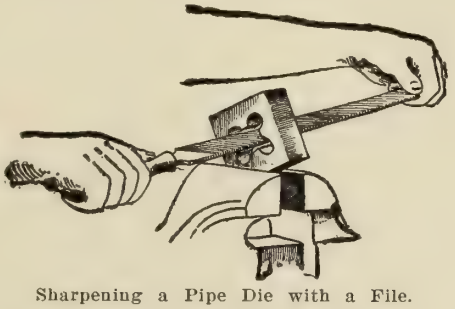
Jig for Slotting Castle Nuts.

they may have slots cut in them. The machine used is an old universal milling machine, which is operated by an apprentice. The only difficulty, if it may be termed such, is that for every size of nut there must be a different-sized stud. This jig enables the company to turn out approximately, thirty ⅞-inch, twenty-six 1-inch, twenty-four 1⅛-inch, twenty-two 1¼-inch, eighteen 1⅜-inch or eighteen 1½-inch nuts every 45 minutes.—American Machinist.

TO SHARPEN A PIPE DIE.

By A. F. Bishop.

I discovered a short time ago that a mill-cut file would sharpen a solid pipe die quite easily and quickly without removing the temper in the die. The first few rubs of the file will slide without

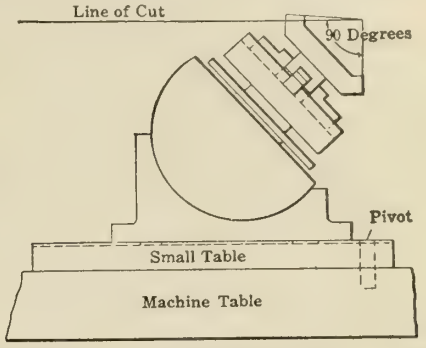

Sharpening a Pipe Die with a File.

cutting, this being due to the grease on the die. Just as soon as the greasy surface is thoroughly worked off, the file will commence to cut, and will cut very smoothly, making a keen edge on the cutting thread. Heretofore I have always worked on emery grinders to try to do this work without removing the temper of the die, but found they worked very slowly on account of the small diameter of the wheels, also that it was quite a nuisance to set the die for the cutting wheel. Most mechanics would not try the file, not having the least idea that it would do the work. That was my case.—Scientific American.

FIXTURE FOR CUTTING MITRE GEARS.

The following method for cutting the teeth in mitre-gear blanks, on a No. 2 plain milling machine with a universal head, is given in the American Machinist. The gears are mild steel, 37 teeth, 6 pitch. They are finished in two cuts and do not require filing. They wear well and run quietly.

A small table with a groove up the centre for the head is secured to the machine table, a ⅝-inch pin being in one end acting as a pivot about which the small table is free to swing. After the blank is set this table is strapped securely. The face and cut angles of a mitre gear together make 90 degrees, and it follows that when the blank is set up for cutting, the apex of the cone angle is in a vertical line with the face of the blank. The blank is set so that this vertical line falls in the centre of the ⅝-inch pin. The table with head is



Fixture for Cutting Mitre Gears on a Plain Milling Machine.

now swung either way an amount that will give a correctly shaped tooth on that side. After going around, swing the table the same amount in the other direction. Of course, the cutter must be set in position before the table is swung either way. The amount to set the table over will have to be found by trial, but once found the same marks will answer for any size mitre gear. The sketch shows this arrangement.

COMBINED DRILLING AND MILLING JIG.

By Wilfrid J. Thompson.

The inclosed sketch is of a jig used for both drilling and milling the lugs of a small eccentric strap, shown at F. A, Fig. 1, is gray iron with the plate B (the drill guide) screwed and doweled to it. C is the locating stop, which is of hardened steel and fits fairly well in the rough ⅝-inch groove in the strap.

The block D is of machinery steel about 1¼ inches wide and is forced up by the wedge E against the bottom of

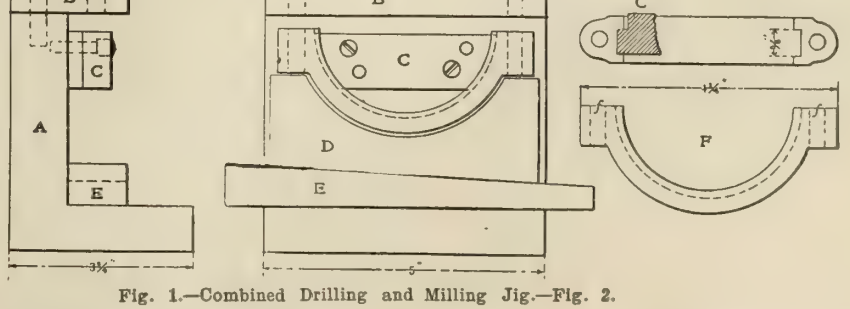


Fig. 1.—Combined Drilling and Milling Jig.—Fig. 2.

the lugs of the strap locating the latter with C and parallel with the top of the jig.

Fig. 2 shows the work in position ready to be drilled. When used as a milling fixture the plate B is first removed. Fig. 1 shows an end view of the jig without the work or block D in place. C_1 is a part section of C.

This is a cheap, easy jig to make, quick to operate, and about as near toolproof as any tool can be.—American Machinist.

INFLUENCE OF GALVANIZING ON STRENGTH OF WIRE.

Wire woven into ropes and cables and used for the most part where the weather exerts a deteriorating influence, requires suitable protection, if its usefulness is to be a dependable factor. Coating with zinc has been found to answer the purpose admirably. Experiment and investigation show the formation of a couplet, in which the zinc of the galvanized iron forms the electro positive element, and the iron the electro-negative, when the material is immersed in water or other fluid. The zinc takes up oxygen, gradually forming a zinc oxide, while on account of the evolution of hydrogen, the iron remains inert, even if the continuity of the zinc coating is slightly broken.

In the process of hot galvanizing, there is no question but that the strength and particularly the resistance to bending and torsion, are considerably affected. Many theories have been propounded to explain the loss of feusile strength. Poor material is cited, but the best has been shown to suffer. The "overdrawing" of the steel has been suggested, but microscopic tests under this head, fail to reveal it as a cause. Irregularity of zinc coating has also been suggested, but it likewise fails to reveal the situation.

Absorbed Hydrogen Gas Does the Damage

The results of many recent investigations show an absorption of hydrogen from the acid bath, in the pickling process previous to galvanizing, resulting in considerable damage to the finished products in the matter of brittleness. Further investigation showed, however, that heating the steel up to 250 degrees Fah. for four hours, removes this bad effect entirely, and shows that galvanized wire can be produced with a minimum loss of physical properties, it being entirely a question of proper practice in regard to removal of damage done by pickling, proper bath temperature, and time of wire remaining in it. The wire should be treated before galvanizing to remove the hydrogen, and the temperature of the zinc bath should be regulated between close limits. The latter is in nowise easy, these being difficulties in pyrometry and proper firing, where many wires are passed through constantly, with consequent irregular lowering of the temperature.

Correspondence

Comments on articles appearing in Canadian Machinery will be cheerfully welcomed and letters containing useful ideas will be paid for.

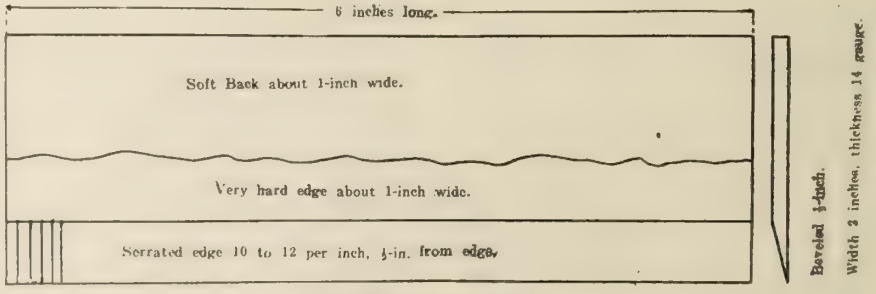
Information regarding manufacturers of various lines, with their addresses will be supplied either through these columns or by letter, on request. Address letters to Canadian Machinery, 143-149 University Ave., Toronto.—Editor.

Designing Propellers.

I have been much interested in reading the recent articles on propellers, their design, measuring of pitch, etc. When Mr. Baldwin set out to select an aviation propeller, he tried to select one from a number of various pitches. He tried to do this with a stationary outfit but found this method unsatisfactory, as the one making the best fan and turning out the greatest volume of air was of course not the best propeller. The selection for his airship was made by fitting up an ice-boat, the propeller selected making about sixty miles an hour.—Reader.

Tempering Small Shear Blades.

We are enclosing you sketch of a knife made of crucible or section steel. Dimensions are, length 6", width 2", and



Small Shear Blade.

14 G. thick, and to have soft back about 1" wide and cutting edge to have extreme hardness about 1" from edge and serrated about ½" from edge, 10 to 12 serrations per inch.

We have experienced much trouble from them warping while being dipped in the cooling bath. The substance we used for that purpose was spring and rain water, salt and water and fish oil, same as that used by the tanners and sometimes called "Tanners' Oil," but warping is caused from using any of the above if heated sufficiently to get the required hardness. While they require to be very hard, yet they must have toughness as well, as they are subject to severe strain and are liable to breakage.

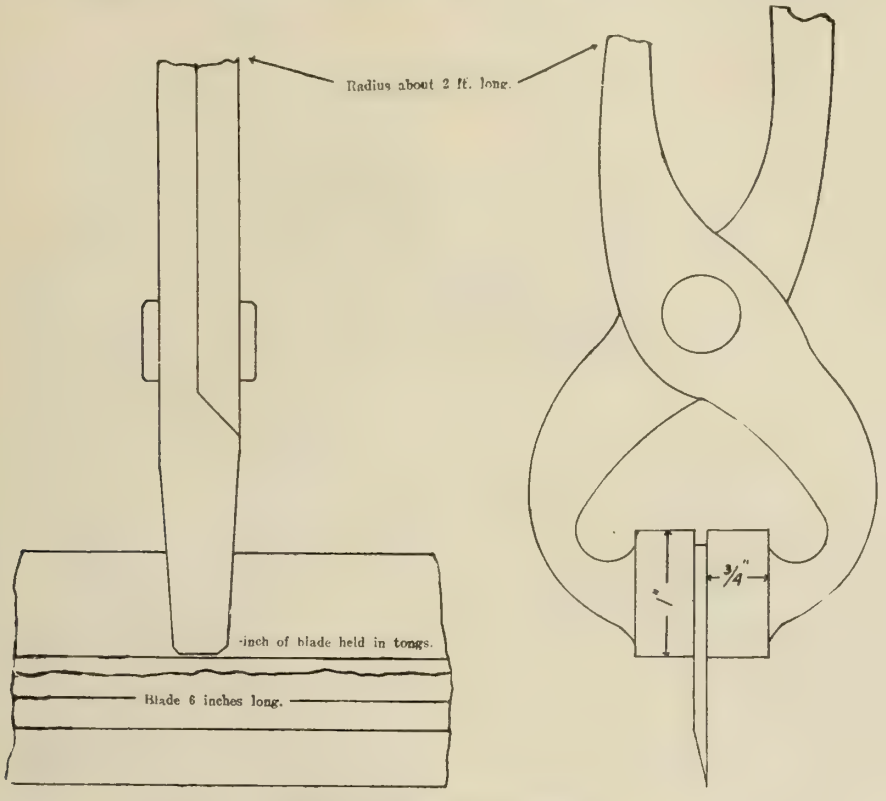
We would therefore consider it a favor if through the columns of "Canadian Machinery" you would prescribe method of heating and tempering the above knife.—C. Smith & Sons.

For heating, make up a large level topped fire on an ordinary blacksmith's hearth and on this lay a flat piece of ⅜" boiler plate, raise and maintain this plate at a bright cherry red heat—about 1480 degrees Fah.—lay the blades to be tempered on the plate until they attain the same heat, they should be then taken off carefully one at a time with a pair of narrow nosed flat tongs and dipped in a bath of rain water that has been raised to a temperature of 210 degrees Fah. "just off the boil," they should be quenched right out, "given all the water," as it is called, and afterwards polished with fine emery;—great care must be taken in dipping that the blades enter the bath exactly vertically and edge downwards. For letting down to the requisite degree of hardness, a pair of broad flat bitt tongs, as shown in the sketch, should be used, heat the tong bitts to a bright red and with them hold the blade to be treated about ¾" from its back edge, the heat of the tongs will draw the temper and when the right color shows on the cutting edge quench out in cold water again, taking care that the blade enters the water vertically. I should think that a medium straw color would represent about the right temper. It will be found that the whole temper will have been drawn from the back, leaving it normal and the hardness will graduate through to the edge, but to obtain a strictly defined line between hardness and softness would be practically impossible.

Any warping or buckling can be removed afterwards by hammering on a planed grey-iron block with a raw-hide mallet, first warming the blade slightly. This re-setting of thin hardened steel plates

is a special trade, known as saw smithing and experts can command very high wages.

In forging the blades great care should be taken against over heating—pure high carbon steel should be worked at as low a heat as possible, and for edge-tools should be always worked one way, "back to edge." If this is done and the steel be of good quality a uniform warping will be observed at the first dip; this can be rectified by bending the blade in the opposite direction before dipping, and it is quite possible to remove the article from the bath quite straight, this practice has to be followed in hardening some kinds of files.—Frank Walker.

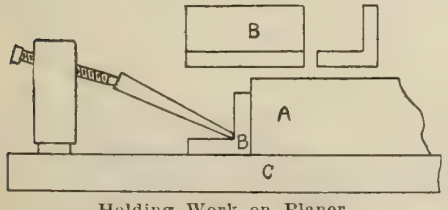


Tongs for Tempering Blades.

These bunters can be made any shape to suit the work. For low work the bunter can be made with a low side and two or more can be used for a job. The bunters are made by milling the two surfaces next the planer bed and the work, a single cut being all that is necessary. They are made indestructible if made of good steel and hardened.—K. Campbell.

Holding Work on Planer.

In the December issue of Canadian Machinery a device was described for holding work on a planer. In the accompanying illustration is shown an angle plate B, sometimes called a bunter,



Holding Work on Planer.

holding the work A on the planer bed C. Its object is to prevent denting finished work which would ordinarily be held by toe dogs or fingers.

CISCOE LATHE TESTS.

An interesting test of a Ciscoe 14-in. lathe, made by the Cincinnati Iron & Steel Co., Cincinnati, Ohio, was made recently. Cuts were made in 0.25 per cent. carbon steel to a depth of 9-16 in. and 36 to the inch friction feed; in the same material to a depth of $\frac{3}{8}$ in. at 18 to the inch screw feed, and in cast iron to a depth of $\frac{7}{8}$ in. at 18 to the inch screw feed. In these tests it was endeavored to break the lathe, but the only part that broke was the belt. This is justly considered exceedingly heavy work for a 14-in. lathe and indicates very forcibly its powerful construction. For these lathes the company has recently has three orders from Canada, two from California, one from Texas and one from New York, and it has also received orders for considerable equipment, including larger lathes from Florida and miscellaneous small tools from Arkansas and Tennessee.

ADDITION TO EDITORIAL STAFF.

Since the first issue of Canadian Machinery it has been the aim of the publishers to keep in close touch with the developments in machinery, machine shop and engineering practice and thus give the readers accurate information on all subjects of interest to them. With the growth of the paper the work of keeping it up to the present high standard has necessitated an addition to its editorial staff. The publishers are pleased to announce that Peter Bain, M.E., formerly of Bain & Mitchell, Montreal, has joined the staff.

Mr. Bain has had 20 years experience in the mechanical engineering field. He is a Clyde technically and practically trained man, having served with Matthew, Paul & Co., manufacturers of stationary, marine and high speed engines. He was on the "Niobe," the cruiser recently bought by the Canadian Government, during her first trials after launching. He was assistant manager at Wm. Spence, Dublin, during the installation of the refrigeration, and mechanical apparatus in connection with the Guinness' brewery extension, and during the construction of a number of locomotives used in this large plant.

Since coming to Canada Mr. Bain served as chief draftsman with the John McDougall Caledonia Iron Works, Montreal, later forming a partnership with Mr. Mitchell, under the title of Bain & Mitchell. He designed the large modern power plant of the Montreal



PETER BAIN, M.E.,

Steel Works, and taught the classes in engineering at the Montreal Y.M.C.A., under the International Y.M.C.A. Educational Board. Many graduates of his classes now occupy important positions in the engineering field. Mr. Bain is therefore well qualified for editorial work on Canadian Machinery.

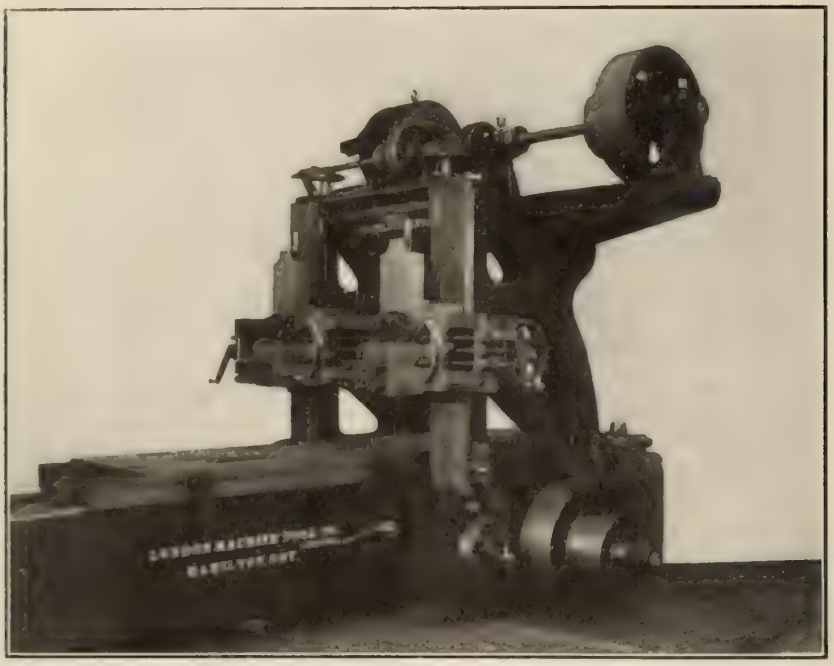
DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

PLANER FOR HIGH SPEED STEEL.

The planer illustrated herewith is designed for the use of high speed steels. Convenience, accuracy and strength were the points considered in its design. For exceptional heavy work the planer may be equipped with double belt drive and pneumatic clutch.

The bed is made in deep box form of close grained iron. The sides are straight, neatly flanged on outside and inside at base. The cross braces are heavy, close together and the V's being well ribbed to web make a stiff and strong construction. The centre to centre of V's on planers is wide and the V's are also very wide. The bed is made sufficiently long to prevent table from lifting under the heaviest cuts when table is at extreme end of stroke.



Planer, London Machine Tool Co., Hamilton.

The table is made deep and stiff, being well ribbed crosswise and lengthwise. The V's are so designed that to prevent grit or shaving from dropping through the table on to the sliding surface, where they will cut and score. The dirt will drop through the table, but will drop on the outside or inside of bed, where it can do no harm. The table is generally drilled with round holes. The T-slots on table are cut from the solid.

The rack is cut from the solid and is secured to planer by means of screws and dowels. The housings are made in heavy box form best calculated to resist the strain due to the heaviest cuts. The housings have a foot on floor, relieving the bed of any bending movement. The faces are scraped to cross bar, and are polished and frosted.

The cross bar has a long bearing on the housings, and is reinforced at centre by box of girder form cast solid with bar. The bar is raised and lowered by power on all sizes from 30 inch up.

The heads have down and angular feed. Slides are all scraped and are provided with gibs for taking up the wear, with means for locking. The gearing is all cut from the solid on accurate gear cutting machinery, and all pinions are of steel.

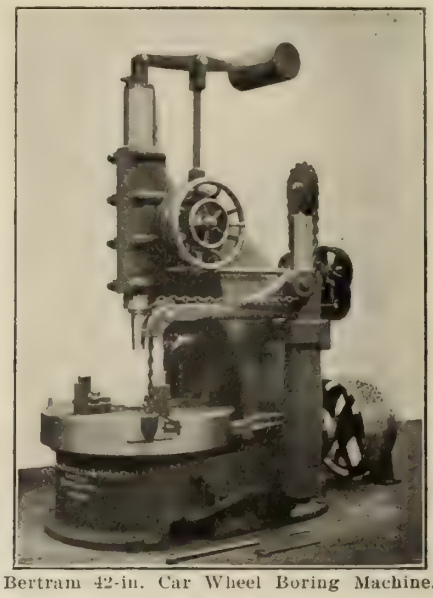
The feed rack is of steel cut from the solid steel bar, and the feed pinion is of steel. Ratchet pinions are all of steel.

This planer is manufactured by the London Machine Tool Co., Hamilton.

CAR WHEEL BORING MACHINE.

The illustration shows a car wheel boring machine made by the John Bertram Sons Co., Dundas. It has a capacity to bore wheels up to 42 ins. in diameter on the tread. It swings 48 ins. in diameter.

The table is provided with five self-centering gripping jaws. The cone has three steps 28, 24 and 20 ins. diameter for 6 in. belt. The boring spindle is counterbalanced and has quick return. It is also provided with three changes of feed, two for roughing and one for finishing, changes from roughing to finishing can be made instantly.



Bertram 42-in. Car Wheel Boring Machine.

The machine is complete with countershaft, wrenches, pneumatic air-hoisting attachment, and power hub facing attachment. By means of the lifting attachment the wheels are picked up from the floor without the aid of a jib, overhead or portable crane and deposited on the floor after machining. This is probably the first machine of this type regularly built.

POSITIVE CHAIN TONGS AND PIPE VISE.

The positive chain tongs shown in Fig. 1, present many features of interest and value to steamfitters and power plant engineers. They are made of drop forged steel, in sizes from ¾ to 12 inch

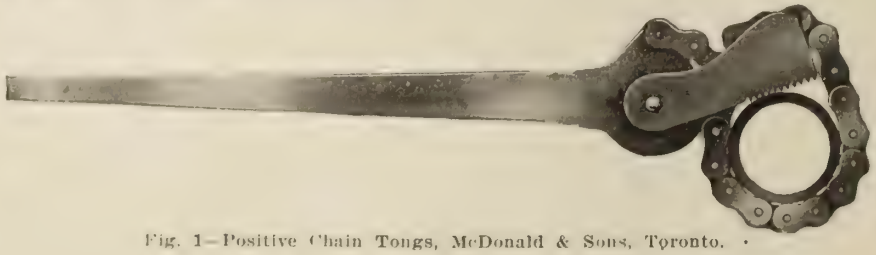


Fig. 1—Positive Chain Tongs, McDonald & Sons, Toronto.

pipe. They are simple in constructional details, strong, light and reliable, are equally useful as pipe or fittings tongs, and grip at all angles. The chain is strong, being made to stand strains in excess of any leverage that may be applied at the end of the handle.

Companion to the chain tongs is a pipe vise, illustrated in Figs. 2 and 3, the merits of which are as follows: It lies flat and open on the bench, permitting lengths of pipe to be placed in or withdrawn freely without risk of wear or damages to the jaws. There are four jaws instead of three as in most patterns, ensuring consequently better gripping qualities. The quick adjustment device consisting of loose nut with shank, knob and spring catch, enables pipe of varying sizes to be inserted and withdrawn without the labor attendant on turning the screw backward or forward each time.

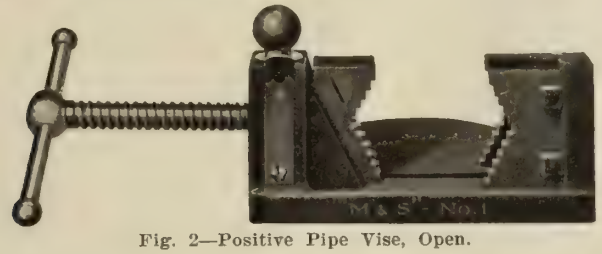


Fig. 2—Positive Pipe Vise, Open.



Fig. 3—Positive Pipe Vise, Closed.

The vise is neat and compact, is made in four sizes from ⅛ to 12 inch pipe, and is patented in Canada and the United States.

MacDonald and Sons, Toronto are the patentees and manufacturers of both specialties.

DUPLEX MILLING MACHINE.

The Waltham Watch Tool Co., Springfield, Mass., has placed on the market the No. 3 Van Norman duplex milling machine shown in Fig. 1. The special feature embodied in the construction of this machine that distinguishes it from other types of milling machines, is the movable cutter head, which is mounted on a ram or frame that may be adjusted in or out over the table to adapt the cutter for use in either a vertical or horizontal position, the cutter spindle being adjustable to any angle from the horizontal to the vertical. Among the features incorporated in the design of the No. 3 size which are not found in the sizes formerly built, may be mentioned the single pulley or constant speed drive with a change gear mechanism for varying the spindle speeds, located in the ram; a geared feeding mechanism; an improved box type of knee; and a solid steel overhanging arm, which braces to give rigidity for either vertical or horizontal cuts.

This machine is solidly constructed throughout and it has ample power for both spindle drive and feed mechanism. The details of the drive and the spindle change gear mechanism are seen in the sectional views, Figs. 2 and 3. The driving pulley A, Fig. 2, is mounted on a splined shaft a, which is supported in a bracket B, attached to the side of the machine column.

There are twelve changes of spindle speeds, varying from 15 to 276 r.p.m., the speed changes being effected by operating the sliding gears F and I and the clutch N. All the gears are of steel, and those within the ram run in an oil bath. A handwheel on the end of shaft f may be used to facilitate bringing the gears into mesh when making changes.

The cutter-head W, which has a 90 degree angular adjustment, pivots on the trunnion ring T. The head is securely clamped on the face of the ram by three locking bolts which move in circular T slots. A bevel gear U on the end of shaft f, and a bevel gear V on the spindle, complete the drive connection. The cutter spindle has the conical form of bearings, and is made with a No. 13 B. & S. taper, to adapt it for holding the large collet holder or reducing collets that are used in this machine. The ram may be securely clamped to the column by means of two binder levers, after the cutter spindle is located in the most advantageous position for operation. This ram has a 13-inch movement in and out over the column, and the adjustment is effected by means of the crank shown near the top of the column. The length of the ram is 35 inches and the width 11½ inches. The driving pulley is 12 inches in diameter, with a 4¼-inch face, and should be run at a constant speed of 300 revolutions per minute.

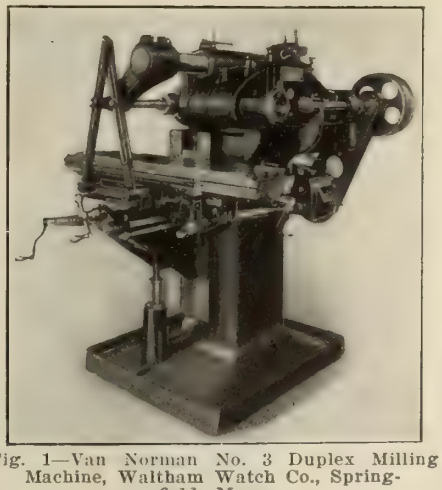
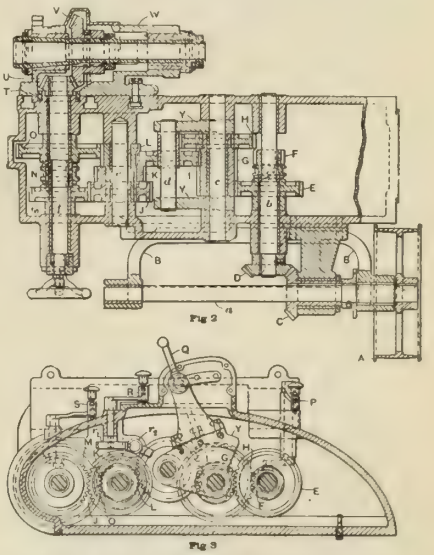


Fig. 1—Van Norman No. 3 Duplex Milling Machine, Waltham Watch Co., Springfield, Mass.

The feed change mechanism gives sixteen changes of feed, ranging from 7-16 inch to 13 inches feed of the table per minute. The drive to the feed-box is by a chain which connects with the main driving shaft. The table, which has a working surface of 45 by 10 inches, has a longitudinal feed of 30 inches, a transverse feed of 12 inches, and a vertical feed of 19 inches. The knee also has a vertical movement of 19 inches. The countershaft furnished with the machine has pulleys 13 inches in diameter and 4½-inch face, for forward and reverse speeds. The swivel vise, also included in the equipment, has jaws 7 inches wide, 1½ inch deep, with a maximum opening of 4½ inches. The weight of this machine is approximately 4,000 pounds.



Figs. 2 and 3—Spindle Speed Changing Mechanism.

PLAIN MILLING MACHINE.

The machine illustrated herewith follows in general outline the accepted usage of column millers, but has a number of features which tend to greater rigidity and strength as well as ease of operation. Substantiating the claim of the

manufacturers, that the machine is well adapted for high speed service.

The column which is cast in one piece has a considerable wider base than common, to resist the weight of table when at extremes of travel, a generous oil retaining rim surrounds this. The knee is of the box type, with extended top, and extra long bearing on column, is fitted with telescoping screw for elevation. The saddle is fitted with compensating stationary nut is very deep and inches long. The table has a great depth and

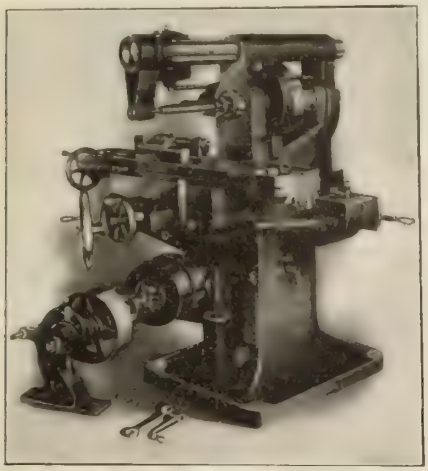


Fig. 1—Plain Milling Machine, Grand Rapids Machine Co.

a working surface of 32 x 8 inches with T-slots extending beyond oil pockets this gives additional space for fixtures, etc. in fact a 10 inch index outfit can be placed on same and allow full range of machine to be cut between centres. The spindle is of crucible steel and is bored for No. 10 B & S taper, and the cut shows the substantial journals as well as driving facilities consisting of a cone of three steps with a 12, 9 and 6 inch diameter for a 3 inch belt also back-gearing of 6½ to 1. When not back



Fig. 2—Phantom View of Feed Changing Mechanism.

geared the cone has four steps 12, 10, 8 and 6-inch. The feed gearing is of the selective sliding gear type. The phantom photos showing same to contain 13 steel gears of heavy pitch which gives 12 feeds.

Driving is accomplished with a nickel steel chain single lever feed control (also shown on phantom photo) operates by throwing lever to the side table should also move to. Pulling it forward disengages the feed.

The machine is fitted with a substantial arbor brace and is of the following range: table travel 24 inches, saddle

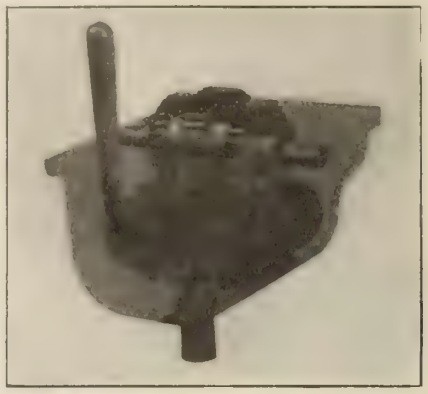


Fig. 3—Feed Controlling Mechanism.

travel 8 inches and knee travel 18 inches. Net weight of machine is 2,020 lbs.

These machines are manufactured by the Grand Rapids Machine Tool Co., Grand Rapids, Mich.

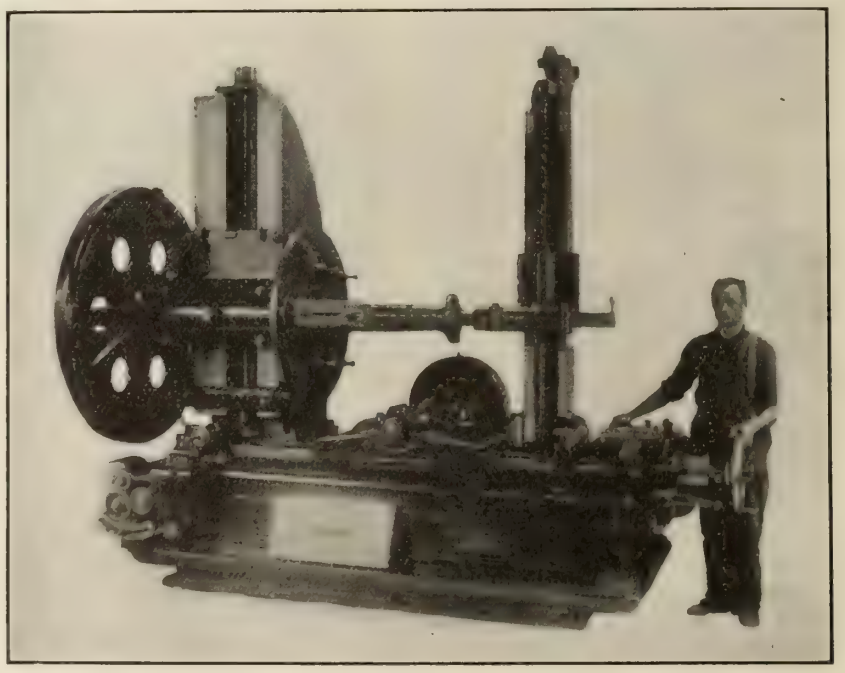
GEAR CUTTING MACHINE.

The accompanying illustrations show an automatic spur gear cutting machine, manufactured by the Newark Gear Cutting Machine Co., Newark, N.J., for heavy spur gears. The machine has a capacity for gears up to 84 in. diameter, 24 inch face, and to cut 6 inches circular pitch.

The cutter spindle, crucible tool steel forging, is provided with a taper hole to receive cutter arbors. The cutter arbor is drawn into and forced out of the spindle, by means of a draw-in bolt, positively, without hammering. The spindle and arbor are amply heavy to secure the benefits of using a gang of finishing cutters, or a gang of finishing and roughing cutters side by side on the arbor. The spindle is driven by means of a powerful spur gear train. The various speed changes are obtained by means of change gears placed as near the last driver as possible. This allows the driving shafts to rotate at constant speed, and avoids undue strains in the shafts when the cutter is running at slow speed on heavy pitches.

The changes of the feed of the cutter carriage are obtained in similar manner, by means of change gears; but the rate of the cutter speed and the rate of the carriage feed are independent of each other, so that one may be changed without affecting the other. The carriage quick return is constant, not being affected by the feed or speed of the cutter. The carriage feed screw operates on the "draw-cut" principle, the thrust collars being placed so that the screw is not subjected to compression strains, either when feeding or returning the carriage. This draw-cut insures a smooth uniform feed to the carriage with freedom from vibration. The carriage also, as will be noticed in the photograph, is especially long, with the cutter spindle bearing in the centre of its length. This construction prevents chattering or vibration, and as the bearings are very long, with narrow guides, the action of the carriage is very smooth and quiet running, even when operating under severe duty.

The indexing or dividing mechanism comprises a large master wheel, and positive actuating mechanism. The master wheel is a worm wheel, generated in



Newark Gear-Cutting Machine.

place on each machine. It is made in sections, that is, a wheel proper, and a ring; this construction being used to insure accuracy not otherwise obtainable. The master wheel receives its movement through the positive indexing mechanism, which embodies a very simple clutch mechanism, requiring no adjustment. The various divisions for different numbers of teeth are obtained by means of change gears, which provide for cutting all numbers of teeth up to 100, and all from 100 to 450 except prime numbers above 100. A wide range of higher numbers can also be cut. Where any unusual number is required to be cut, this can be done by means of an extra change gear.

In connection with the positive indexing mechanism, is a safety device, which prevents the carriage from feeding until the division has been correctly completed. This is especially valuable when it is considered that the machine cuts very large and expensive gears. A safety mechanism also acts to prevent the machine from dividing when an obstruction on the gear blank, such as a lug or flange, would collide with the rim support, and otherwise, if it were not for the safety device, injure the gear or the machine. This mechanism is entirely automatic, and does not require any setting or adjustment, as it operates regardless of the size of the gear or the number of teeth being cut. It also is valuable, as though its interlocking feature, it prevents the operator from engaging the feed mechanism, while the machine is dividing.

The work spindle is of large diameter, machinery steel, accurately ground. It is provided with a taper hole, to receive work arbors; a draw-in bolt acting to draw the arbor in and force it out positively. The work head is of massive proportions, and is so gibbed to the head, that the alignment is maintained without regard to which of the clamping bolts is tightened first. The head is provided with screw and micrometer dial, graduated to read to thousandths of an inch. Power mechanism is provided for quick adjustment of the head, either up or down. The machine is very convenient, all the operating features being under the direct control of the operator.

DIXON'S STEEL CAR PAINT.

The Joseph Dixon Crucible Co., Jersey City, N.J., have just issued a very attractive little booklet of envelope size on their paint for steel cars. The booklet not only goes into the merits of the Dixon paint for this service, but illustrates a number of different types of steel cars upon which Dixon's paint has given excellent service. It also contains color chips showing the four colors in which Dixon's silica-graphite steel car paint is made. Anyone interested in steel car painting should send for a copy of this booklet which will be forwarded, free of charge.

TUMBLING BARREL.

The Globe Machine & Stamping Co., Cleveland, O., have placed on the market a new type of horizontal tumbling barrel for burnishing articles prior to plating, and for polishing either plated or unplated parts. The burnishing is effected by the use of steel balls. The barrel is of cast iron lined with maple wood and has an octagonal cross section. These machines are made with three sizes of barrels, the smallest of which is 24 in. in diameter by 8 in. wide, and the largest 30 in. in diameter with a width of 16 in. They are also furnished in either the single, double or triple-barrel types.

KILLING MOLDING MACHINE.

A molding machine of the jarring power rockover type has been brought out by E. Killing's Molding Machine Works, Davenport, Iowa. When the machine is being operated, the pattern is mounted on a pattern board and the whole is fastened to the rockover table. After the flask is in place and filled with sand, the mold is jarred to the proper density by compressed air, which is alternately applied and released automatically in the cylinder under the jarring table. Air is employed for this purpose and the pattern may be withdrawn at the speed which will give the best results. The jarring cylinder and the valve are simple in construction and the latter is of the expanding ring piston valve type. No springs are sued on this machine and all working parts are protected against the abrasive action of the sand.

NEW CORE RAMMING MACHINE.

The Norcross jarring machines manufactured by the Arcade Mfg. Co., Freeport, Ill., have been used extensively for ramming large cores. In order to make it possible to use a machine of this kind to better advantage a special type has been brought out and is primarily designed for ramming cores. It is shown in the accompanying illustration.

The total height of the machine is 15 inches. The piston is 8 inches in diameter and carries a table 24 by 30 inches. The piston travel in one-half inch and it will lift one thousand pounds. Under the table there is arranged a circular guide to keep the parts in line.

IRON AND STEEL BOUNTIES.

The bounties paid upon the manufacture of iron and steel expired on December 31, 1910.

In 1909 the bounty paid came to $1,808,533. This went in great part to the Dominion Steel Corporation, $1,029,503; to the Algoma Co., Sault Ste. Marie, $348,814, and to the Hamilton Steel & Iron Co., Hamilton, $238,408.

The rate paid in 1910 was 90 cents a ton for pig iron, 60 cents for puddled bars, and 60 cents for steels. Unless something is done at Ottawa these bounties will not be paid after this year.

CANADIAN ORE PRICES.

It is reported that the comparatively small block of Canadian iron ore recently contracted for by an eastern blast furnace for next year's delivery, was bought at close to 8 cents, delivered, per unit of iron at consumer's plant. From the standpoint of ore sellers, this is looked upon as a favorable price considering the grade of the ore disposed of and it tends to add weight to the expectation that foreign ores will probably sell at higher prices next season at eastern seaboard than the present year. Already it is understood German and English iron makers have contracted for large quantities of Swedish ore for next year's delivery, which on the same mine basis would make a pretty high price delivered at eastern seaboard.

Universally in the east there is a belief that the contracting in eastern domestic and foreign ores will not begin until late spring under present conditions of trade. It is certain that with curtailed operations the average eastern pig iron maker has more ore on his hands at this time than he had bargained for. Some contracts for domestic lump ore have been taken out freely and are puite well filled, but considerable furnace ore will be carried over until next year. Domestic shipments in November were not as heavy as in October, and this has been due largely to the activity of some consumers in the latter month taking in more ore than their actual needs in order to protect themselves against handling difficulties in winter.—Iron Trade Review.

According to the specifications of the United States Navy Department, high speed tool steel furnished to the department must have the following chemical analysis: tungsten, from 18.5 to 19.5 per cent.; chromium, from 5.25 to 6 per cent.; vanadium, from 0.1 to 0.35 per cent.; carbon, from 0.55 to 0.75 per cent.; the manganese content must not exceed 0.15 per cent.; silicon not more than 0.11 per cent.; phosphorus not more than 0.02 per cent.; and sulphur not more than 0.02 per cent. There must be no other impurities, and particularly not molybdenum.



COST CARD.

The Canadian Billings & Spencer Co., Welland, Canadian manufacturers of drop-forgings, have an excellent cost card system in use, brought from the home plant at Hartford, Conn.

The accompanying cut shows the form of card used. All the necessary data concerning size, cost, etc., of the article is embodied, and, in addition, similar information respecting the dies is given. From the information under "Dies," the method of manufacture can be seen, as the different kinds of dies and the numbers required of each are given.

In conjunction with this information a photo of the article, photographed beside of scale, is attached to the back of the card. This system is in more or less common use in the United States, in varied forms, but in forms somewhat differing from this one. It gives a complete record of the article, from material to details of appearance, in very convenient form.

Date Sept. 10/1910 No. A 2120

John Smith Co.

Forging Crank Shaft per lb. .03

Stock Type A24 Size 2" sq. Length 15" Wt. 17# Cost .51

Wt. fin. 13 Piece price .10 Av. 40 Qty. 500 By Jones

Shop exp. — Cost — Price

Annealed, pickled, trimmed, tumbled, c. d., h. d., machined

—DIES—

Finish 2 B. D. CAST STEEL C. D. 1 Trim HOT ~~CAST~~ 2 Punches CAST STEEL

Die Orders

First cost of Dies 263 54/100 Location of Dies Sec B Location of Sample Rack 6 Drawer 2

—REMARKS—

Cost Card.

LOWER BUSINESS TAX.

A Tax Reform League has been formed, Toronto is endeavoring to secure sufficient strength to influence the changing of the Ontario Assessment Act so as to allow municipalities to tax buildings, improvements, business assessments and incomes, at a lower rate than land values. The organization has offices at 75 Yonge St., and is sending out the following circular drawing attention to the objectional features of the present Assessment Tax :

"The business and income taxes of the present Assessment Act are especially objectionable.

"Under the income tax, the salaries of the officers of incorporated companies are taxed, while the incomes of the same persons under a partnership would be free. Thus the income tax is, in many cases, a penalty on a particular form of business organization.

"The business tax, since it is based on the value of the premises occupied, is really a double tax on buildings and improvements and penalizes the building of large, attractive and commodious premises, to the detriment of the employes, of the building trades, and of the general public.

"On the other hand, a moderate increase in the tax on the value of all land, whether used or unused, inclines the owners to meet the offers of those who desire to develop it, and when coupled with reduction of the building and business tax, results in an increase of all productive enterprise.

"So far from being a new, radical or revolutionary measure, the plan of allowing municipalities to reduce taxes on buildings, business assessments and incomes, has been tried for years in New Zealand, New South Wales, and our own Province of British Columbia with satisfactory results.

"This measure is eminently conservative, since it recognizes that conditions differ in different municipalities, and provides that each municipality may alter its system only after due consideration and on favorable vote of the ratepayers.

"We, therefore, commend this proposal to business men, in the hope that they will consider it in relation to their business interests, and support the demand for local control of local taxation."

In Toronto the Association have already secured the signatures of a large number of manufacturers in favor of this move, among these being :

R. E. Walker & Co., R. E. Walker ; Phillips & Wrinch, Chas. C. Phillips, president ; House of Hobberlin, A. J. Moreland, secy.-treas.; Jacques, Davy & Co.; Goldsmiths' Stock Co., Walter J. Barr, president ; Richard Southam, managing director Southam Press ; Hudson Co.; Farmers' Dairy Co., P. P. Farmer, Manager ; Noble Scott, printing ; Marshall Sanitary Mattress Co., Alan C. Thompson, mgr.; R. J. Hunter & Co., A. E. Brownlee, prop.; Frankel Bros.; Carswell Co., R. Carswell, general manager ; General Leather Goods Co., R. H. Cameron, manager ; National Leather Co., R. R. Corson, secy.-treas.

CENSUS OF CANADIAN MANUFACTURERS.

Archibald Blue, chief officer of the Census Department, Ottawa, gives notice that on June 1 next year a census will be taken of the manufacturers of Canada. It will ascertain the capital employed in works in 1910 along with the value of land, buildings and plant, the kind or class of products of the works by quantity or number of finished article and their value in the year. These statistics will relate generally to factories employing five hands or more during the year, but in such industries as flour and grist mills, brick works, saw and shingle mills, electric light and power plants, and a few others where the value of products is large in proportion to the number of persons employed, returns will be required without regard to the number of employes. The employes of work will include managers, superintendents, etc., on salaries ; officers, clerks, etc., on salaries ; operatives or workers classed as over and under 16 years on wages ; and piece-workers employed outside of the works. Salaries, wages and payments to all officers and employes will be entered on the schedule for the census year by sex, and will include the aggregate weeks employed in the year, average hours of working time per week, and aggregate wages paid to them in the year. The aggregate weeks of time and the aggregate wages paid will refer to the whole body of employes for the year while the average hours of working time will refer to an average computed for all employes in the year for one week only. The census of the dairy industry, relating to the production of butter, cheese, cream and condensed milk, will show for each kind of product its quantity and selling value, and the quantity of milk and cheese used for conversion at the factories, the number of patrons, and the amount of money distributed to them in the year.

LESSON IN EFFICIENCY.

W. R. Towne, president of the Yale & Towne Co., Stamford, Conn., states that by the use of scientific methods and automatic machinery, his company, within the past six years, has achieved increased output, decreased labor cost and increased wages to employes.

CANADIAN MACHINERY EDITORIAL INDEX.

Beginning with the January, 1911, issue the reading matter will be indexed separately from the advertising. This is done in order to supply each reader with a reference index at the end of the year.

SAFETY DEVICE CATALOGUES WANTED.

Kent McNaughton, Association Rooms, Stevens Building, Detroit, Mich., request catalogues from manufacturers of safety devices. He would like to receive as much literature on this subject as possible and therefore requests manufacturers whose catalogues show safety devices in connection with their own machines or apparatus to send him copies of such publications.

PERSONAL.

C. W. Lang, construction superintendent of the Dominion Coal Co., is leaving that position to engage in the service of the Brown Machine Co., New Glasgow, N.S., in which he has purchased an interest.

A. W. Wheatley, of the American Locomotive Works Co., Montreal, has assumed charge of the Brooks plant of the American Locomotive Co., succeeding John R. Magarvey, appointed manager at Schenectady, N.Y.

Clarence H. Booth, of Toronto, son of George Booth, president of the Booth-Coulter Copper & Brass Co., has been appointed general manager of manufacturing for the E.M.F. Co., of Detroit, to succeed David Hunt, Jr.

A. C. Hanna, formerly secretary of the Dominion Wire Co., Montreal, has gone to Winnipeg as sales manager there of the Steel Co., of Canada.

RECENT ADVANCES IN G. T. R.

Several important changes have recently taken place in the management of the G.T.R. shops at Battle Creek, Mich., Montreal and Toronto. J. C. Garden, master mechanic of the G.T.R. shops at Point St. Charles, Montreal has been transferred to a similar position in the new shops at Battle Creek.

J. J. Duguid, formerly general foreman of the Toronto shops, has been advanced to the position of master mechanic of the G.T.R. Eastern Division. Mr. Duguid's former position is filled by William Sealey, formerly foreman of the erecting shop, Stratford. Mr. Sealey is succeeded by W. Davis, formerly chargeman. Mr. Davis is in turn succeeded by J. Hollingsworth.

WINNIPEG RAILWAY CLUB.

At the last monthly meeting of the Western Canada Railway Club, held at the Royal Alexandra, Winnipeg, the feature of the evening's proceedings was a paper on "The Training of a Railway Employee," delivered by H. Martin Gower, superintendent of apprentices for the Canadian Pacific Railway at Montreal. The paper, which was of some length, dealt with the necessity for technical education, gave many statistics on the matter, and adduced suggested lines of systematized training. It was well received by the members present, about 100 in number, and a discussion followed.

CENTRAL RAILWAY CLUB.

The regular meeting of the Central Railway and Engineering Club, Toronto, was held on Dec. 20, when Gordon C. Keith, managing editor of Canadian Machinery, read a paper on "Modern Machine Tool Practice for Maximum Production."

The following officers were elected for 1911: President, G. Baldwin, yardmaster, Canada Foundry Co., Toronto; 1st vice-president, G. Bannon, chief engineer city hall; 2nd vice-president, A. Taylor, foreman boiler maker, Polson Iron Works.

Executive committee: A. E. Till, foreman C. P. R.; E. Logan, machinist, G.T.R.; C. G. Herring, chief draftsman, Consumers Gas Co.; A. E. Wilkinson, Lunkenheimer Co.; A. M. Wickens, chief engineer Canadian Casualty and Boiler Insurance Co.; W. E. Cane, supt., Chapman Double Ba" Bearing Co. and A. J. Lewkowicz, consulting engineer, Universal Gas Co.

Auditors: J. Herriot, general storekeeper, Canada Foundry Co.; D. Campbell, storekeeper, Consumers Gas Co., and A. W. Durnan, of Rice Lewis & Sons.

CLAY PRODUCTS ASSOCIATION.

At the annual meeting of the Clay Products Manufacturers Association held in Toronto recently, the election of officers for the ensuing year took place as follows:—Pres., Robert Davies, Toronto; First Vice-Pres., D. A. Lochrie, Toronto; Second Vice-Pres., W. H. Freeborn, Brantford; Third Vice-Pres., David Martin, Thamesville; Sec.-Treas., D. O. McKinnon, Toronto.

TANNERS' SECTION B. OF T.

The officers elected at the recent meeting of the Tanners' section of the Toronto Board of Trade are:—

J. J. Lamb, chairman.

F. B. Clark, vice-chairman.

F. G. Morley, secretary-treasurer.

Executive committee—J. C. Breithaupt, S. R. Wickett, W. D. Beardmore, George McQuay, C. G. Marlatt, Geo. P. Beal, George C. H. Lang, A. O. Beardmore, Charles King, A. R. Clarke, E. J. Davis.

Legislation committee—Chas. King, S. R. Wickett, A. R. Clarke, George P. Beal, A. O. Beardmore, Hon. E. J. Davis, R. M. Beal.

Transportation committee — J. C. Breithaupt, C. G. Marlatt, S. R. Wickett, John Sinclair, Geo. C. H. Lang, W. D. Beardmore, A. O. Beardmore, R. M. Beal, Charles King, A. R. Clarke, E. J. Davis. Representative to council, A. O. Beardmore.

WINNIPEG MACHINISTS ELECT OFFICERS.

The International Association of Machinists, lodge 122, Winnipeg, held its annual election of officers on Dec. 7. Great interest was manifested and a large proportion of the membership, which is now upwards of 300, took part in the proceedings. The result was as follows: A. Sturrock, president; S. Holliday, past president; G. Johnston, vice-president; H. F. McDonald, recording secretary; D. McCallum, financial secretary; A. Robertson, treasurer; S. Miller, constructor; C. Cross, sentinel; E. McGrath, R. F. Shore, and D. McCallum, delegates to trades and labor council; S. Holliday, J. Muir and E. Emerson, delegates to federated trades council. A committee consisting of H. F. Macdonald, S. Miller, H. M. McGregor, A. Young, J. Addison, W. Patterson, D. McCulloch, and J. C. Mountjoy, was appointed to make arrangements for the annual entertainment which will be held early in 1911.

TORONTO MACHINISTS ELECT OFFICERS.

Toronto Lodge 235 of the International Association of Machinists elected officers for 1911 as follows: President, W. Hagan; vice-president, J. Waphott; recording secretary, R. McDonald; financial secretary, T. A. White; treasurer, W. Dill; conductor, Wm. Gravell; inside sentinel, E. Cole; executive committee, J. McNaulty, Newton Henders, T. Burgess, J. Blugerman; auditors, D. Montgomery and W. Singer; trustee, Thomas Walsh; business agent, L. H. Gibbons.

The general solution of the problem of industrial education must be by means of public industrial schools, where such fundamentals will be taught as will prepare boys and girls for the industries of the surrounding territory —remembering that the aim and end of all education is to train men and women to think.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

BELT PULLEYS.

By Peter Bain, M.E.

IN the selection of power transmission equipment, much consideration is given to power saving ; but while the prospective buyer is sacrificing time and money, investigating the more or less expensive devices that come under this head, he invariably overlooks the great saving that can be effected by a careful selection of pulleys.

Pulley Factors.

In determining what pulleys are best to use in any equipment, the factors of windage, weight, balance, belt contact, powerful compression to avoid keyseating of shaft, and convenience of handling, should have prime consideration, as affecting economy of power in subsequent service. A choice of pulleys which fulfills these requirements may mean a somewhat higher initial outlay, when compared to a choice made without regard to anything, save suitability of diameter, pace, hose, etc., but will mean annually, however, a much reduced operating expense in comparison. To save much time and annoyance later, it is advisable to have all pulleys in halves, facilitating as it does, replacements often hurriedly required.

Comparison of Pulleys.

Pulleys as manufactured, are of cast iron, wrought iron, mild steel, wood and iron or steel in combination with wood, the shaft bushing perhaps being more or less common to all. Iron pulleys of all kinds show a distinct loss of power, when compared with those in wood, due to belt slippage, and amounting in accordance with test and experiment to as much as 50 p.c. Wrought iron or steel pulleys with perforated rims do not show so unfavorably as those in cast iron. For good belt contact, minimum slippage, and least power absorbed without recourse to belt dressings to secure adhesion, the wood rim is to be commended.

Belt dressing should only be used to keep belts pliable, and not to keep them from slipping. Its use for other than the former purpose, shows faulty installation and want of attention on the user's part.

Cast iron pulleys again are objectionable on account of weight, and require in this respect, compared with wood pulleys, more power to operate, while as favorably placed regarding windage. Wrought iron pulleys while light, and attractive as regards windage, do not give satisfactory balance, especially when split, and are not on the same plane as a properly designed wood pulley.

It must of course be borne in mind that there are good and bad features in wood pulleys. Belt contact, reduced weight, and facility of handling, are generally speaking strong points in their favor, but unless at least the equivalent windage of a well designed cast iron pulley be had, the other gains may be almost all offset. The properly designed wood pulley should be the equal of other types in their best features, and their superior otherwise.

Windage.

An absence of windage is not always a feature of wood pulleys, a circumstance unfavorable to their more universal adoption, and responsible for their career being prematurely closed in many installations. The elimination of this difficulty is not insurmountable, and already much has been done, so much in fact, as to bring the wood pulley windage on a par at least with that of the best in cast iron pulley design, and putting it in a class by itself for cheap operating cost in power transmission, with an ultimate influencing of its larger adoption. The improvement necessary in the reduction or absence of windage in wood pulleys, lies in the arm attachment between rim and hub. To get equal results, the arms should be of a shape corresponding to those of cast iron or somewhat similar, the material light, rigid, reliable, and attached securely to rim and hubs. Arms of cold drawn seamless steel tubing, pressed into ribbed form, and forced into a taper hole on bases of a malleable iron hub, these upset and headed over on end, constitute a fastening which has come under the writer's notice as having much to recommend it. The arm and rim attachment is housed within the rim, and consists of a saddle piece embracing the flattened end of arm, and fastened to it by steel pins driven into rim.

Belt Pulley Speeds.

The wood pulley has advantage over those of iron or steel, in that it can be run at a much higher speed, ordinarily three times as fast, while experience shows that it is impracticable to run pulleys of iron or steel for mill and factory purposes at greater rim speed than five to six thousand feet per minute, roughly one mile per minute. As showing what can be done, a wood rim pulley with iron spider has recently been made and tested by the Dodge Mfg. Co., to run safely at five and one-half miles per minute. Such a result is intensely interesting, and serves to emphasize the benefits to be derived from a more extensive use of well designed wood pulley equipment.

Shaft Attachment.

The shaft attachment of pulleys is a matter of some importance, necessitating as it does, the cutting of the keyways, the use of set screws, or reliance on the compression of the bushing alone.

Solid cast iron pulleys invariably require keyseating of the shaft, the only exception being for very light loads. No keyseating means a reduction of outlay, a rapid convenient attachment, and an unimpaired shaft strength. It must never be forgotten that keyseating a shaft reduces its strength at that point, and in the case of cold rolled shafting, much of which is used in power transmission, and which depends on its unbroken surface for maintenance of comparative strength, keyseating is highly detrimental, placing it inferior to turned shafting under the same treatment.

Hurry jobs call for easy yet effective fixings, and cold rolled shafting and keyless pulleys do much to help out awkward situations.

Hub Bushings.

Cast iron bushings with large bearing surface are best adapted for all pulleys, because when properly compressed, they exert a positive contact with the shaft. The adaptability to compression depends much on the elasticity of the hub material, and a malleable iron hub, light yet strong, seems to give with the cast iron bushing, results hard to surpass in the matter of keyless shaft attachment.

Conclusions.

The belt pulley question is of wide interest, and does not have that importance in the estimation of large and small users (the latter particularly) that it should. With the various manufacturers there lies the looked for improvement in pulley development, which will give the user a highly efficient service and convenience, leaving first cost if high, to be justified by ultimate operating results.

G. P. & H. ELECTRIC LOCOMOTIVE.

THE accompanying illustrations show two views of the new electric locomotive recently purchased by the Galt, Preston and Hespeler Street Railway Co. This company operates some 30 cars on a standard gauge interurban line, 21 miles in length, connecting the above points with the towns of Freeport, Centreville, Berlin and Waterloo. The power station and repair shops are located at Preston. The railway traverses

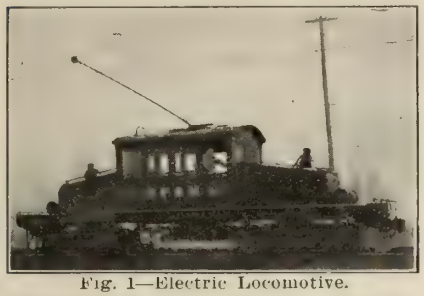


Fig. 1—Electric Locomotive.

a farming country and does a thriving business in both local and through passenger and freight service.

Several years since the G. P. & H. Ry. Co. purchased from the Westinghouse Electric & Mfg. Co. a quadruple equipment, consisting of four No. 93-A direct-current motors with a nominal rating of 60 h.p. each at 600 volts, for a locomotive similar to the one shown, but of smaller capacity. Its operation has been eminently satisfactory in every respect and the recent order for a larger locomotive of the same general characteristics argues strongly for the excellence of design and low maintenance charges of this type of slow speed freight locomotive.

Much has been said about the impracticability of electric freight haulage but the steadily increasing sales of slow speed electric locomotives especially designed for freight service and the invariably favorable reports of operation is affirmative evidence of the most forceful nature. There are many interurban electric roads tapping sparsely settled farming districts and outlying towns not favorably located on main steam trunk lines, which could develop a highly profitable express and freight traffic with the aid of a suitable electric locomotive.

The G. P. & H. locomotive shown was built by the Baldwin Locomotive Co., and the complete electrical equipment furnished by the Westinghouse Electric & Mfg. Co., Pittsburg. It is designed for the standard 4 ft. 8½ in. gauge and provided with double swivel trucks. The wheel base is 29 feet and the overall dimension 36 feet and it weighs complete, 100,000 pounds. The gear ratio of 16.57 gives a normal speed of 8.25 m.p.h. at which speed a tractive effort of 18,200 lbs. is developed. The maximum tractive effort is 25,000 lbs. The locomotive carries a quadruple equipment consisting of four No. 308-B-2 interpole direct current railway motors having a nominal rating of 100 h.p. each, or a total of 400 h.p. at 600 volts. These motors are fitted with special windings adapting them particularly for slow speed locomotive service. Standard nose suspension is used.

The Westinghouse unit switch control was provided. Two master controllers are supplied one in each end of the cab. These controllers carry only the very small current from a storage battery, for exciting the electro-magnetically actuated needle valve which admits air at 70 lbs. pressure to the air cylinders of the unit switch. The action of each switch is therefore positive and independent of fluctuations of the line voltage. It not infrequently happens on interurban and stubend lines that the voltage at points far distant from trolley feeders is as low as 200 volts when the motors are in operation. Under such extreme or even less severe conditions solenoid operated contractors, depending upon the line voltage for their contact pressure, are very apt to give trouble due to looseness and arcing at the contacts. With air operated switches all such possibilities are eliminated and the greatest reliability under all conditions assured.

Fig. 2 shows this locomotive hauling a loaded train weighing 1,040 tons on the experimental tracks of the Westinghouse Co., near Trafford City, Pa. This was the heaviest load available at the time, though it was evident that under similar conditions the locomotive would have handled a 2,000 ton train with equal ease.



Fig. 2—Electric Locomotive, with Normal Draw Load.

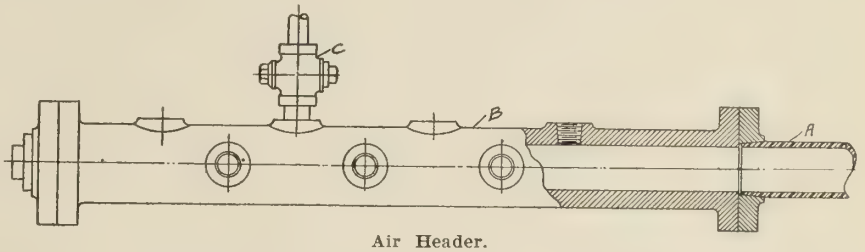
OXY-ACETYLENE CUTTING.

Recently the bridge over the Don river, Toronto, was moved to make room for another structure. It was necessary therefore to cut the 16 in. water main, which was suspended underneath the bridge.

Instead of adopting the old method of cutting the pipe with a hard chisel, or boring a number of holes and then sawing it through, the task was accomplished by means of an oxy-acetylene flame. The Davis-Bournonville system was used under the direction of Mr. Fennel. When the flame was turned on the ⅝-inch metal it rapidly bit into it. This operation was completed inside of fifteen minutes. A second cutting had to be made some eighteen inches further back to take off a section of the pipe, to prevent it catching on the abutments when the bridge was moved. The operation had to be conducted at both ends of the bridge, and the whole work was accomplished inside an hour.

AIR HEADER.

The accompanying cut shows a convenient form of header for use in distributing compressed air from air mains, where the number of tools at any particular spot are more than two or three.



Air Header.

This header permits of eight lines of hose being taken off from the one spot, and is a device found very convenient in the shop and yards of the Collingwood Shipbuilding Co., Collingwood, Ont., especially when constructing the boat on the ways, as a multitude of pneumatic hammers, and drills are in use.

Pipe A is connected by a T to the air main. The header itself, B, is a cast iron body with two sets of holes at right angles, staggered, thus facilitating hose connections. From each of these eight bosses on the header, the hose pipes lead out, with an independent valve, C, on each. The pipe A may be given a valve as well, permitting of the shutting off of the whole head.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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G. C KEITH, M E., B.Sc., Toronto - Managing Editor
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FRANCE
PARIS John F. Jones & Co., 31bis, Faubourg Montmartre, Paris, France

Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s 6d., per year: other countries, $1.50. Advertising rates on request.

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Vol. VII. January, 1911 No. 1

EFFICIENCY OF RAILROAD SHOPS.

Discussing the paper on "Modern Machine Tool Practice for Maximum Production," read before the Central Railway and Engineering Club, C. A. Jefferis, General Superintendent of Consumers' Gas Co., Toronto, said that the mechanic in the ordinary small shop was not as fully acquainted with the developments in machine tools and high speed steels as the one employed in a railroad shop. This is a very important statement in view of the fact that the daily papers and others would have us believe that the railroads are wasteful, uneconomical and unscientific. Supporting this latter view, Louis D. Brandeis, representing the eastern shippers before the Interstate Commerce Commission, declared the railroad methods lacked technical skill and scientific accuracy, that by the application of these the cost of operation would be enormously reduced. The rigid economy of scientific methods forced upon ordinary industries by the pressure of competition, has not, according to Mr. Brandeis, developed among the railways to a proportionate extent.

The argument can be answered by one of his own references. He cited the case of the Santa Fe railroad, giving figures showing that in six years a saving of $5,800,000 was effected by improvements in methods.

The Santa Fe railroad is a most progressive one, as are also such railroads as the New York Central, Canadian Pacific and Grand Trunk railroads. As for the car, locomotive and repair shops of these railroads, the methods are both scientific and economical. Men are technically trained under the supervision of the companies. Apprenticeship systems with educational classes are features of the four above mentioned railroads. The result is that railroad practice is modern in every particular.

When high speed steel was introduced the railroads were among the first to take hold of it. The machine tools used in railroad shop practice have developed to such an extent that the companies are waiting for some genius of the Taylor type to develop a still better steel than that with which we are now acquainted. The railroad shops of the G. T. R. at Stratford, Ont., and Battle Creek, Mich., and the C. P. R. Angus shops at Montreal are examples of the result of trained minds seeking the best shops and equipment procurable.

While the railroads are not responsible for all the improvements in machine tools, still the manufacturer using metal working machinery should keep watch on the methods of the railroads. They are always ready to give anyone desiring it the benefit of their experiences. In almost every issue of Canadian Machinery railroad shop methods are given, showing the trend of modern practice in railroad shops. While the various industries have been making improvements, the railroad shops, too, have been keeping pace with the advances in the mechanical field.

COMMON COURTESY.

That common courtesy pays is beyond a doubt, whether in the shop or office. The apprentice and workman owes it to his foreman as also does the foreman to those under him. A foreman is responsible to the management for the workmanship and behavior of the employes. His instructions should be carried out carefully. The foreman is the medium through which a workman secures advancement, and be sure he will assist the man who is square and courteous to him.

Then the management will secure loyal foremen and workmen by being courteous to the employes. They must depend on the men to turn out good work, and when treated with consideration, the management need never be ashamed of the workmanship.

There is still another point. Those entrusted with correspondence should be courteous. Brevity is being aimed at in all business correspondence, but do not let the shortness of the letter prevent it being courteous. A letter should be written so that a favorable impression is at once created. Be sure a study of common courtesy in letters will result in making friends and securing business.

HEALTH AND CARE OF EMPLOYES.

The health of employes in manufacturing establishments constitutes a factor in economical production which is highly worthy of consideration. The workman who has to be absent a part of the time because of bodily ailment must necessarily upset shop routine; if his work is highly specialized, so that it is difficult to fill his place temporarily, the result may be serious in disturbing the balance of manufacturing. Even if a man continues his employment despite impaired health his usefulness depreciates perceptibly.

Progress in shop sanitation has of late been rapid. Good light, ample ventilation, better heating apparatus and approved toilet conveniences have been carefully provided. Manufacturers have kept pace with the general movement to better the condition of those whose days must be spent in factories. Environments have been made satisfactory in most trades, and reading, rest and lunch rooms have been provided.

An excellent beginning in the direction of looking after the health is being made in the public schools by instruction in the hygiene of the body and by a system of medical and dental inspection. Many cities employ physicians to inspect the schools regularly for cases of

sickness, defective hearing and sight, etc. In a few places high class dentists are provided to make compulsory examination of the teeth of children and to furnish treatment free of charge or at small cost. If this system spreads through the country, as it is believed it will, the workman will be blessed. It is advocated that the education of employees, especially of young persons, in this direction would bear profitable fruit.

In a small way this sort of work is aready going on. The foreman who takes an interest in those under him will advise skilled treatment for any trouble that comes to his attention, especially if it causes the employe to lose time. It is confidently prophesied that the general modern movement will go much farther than the point it has now reached, as the employer assumes a more direct interest in his working people, impelled by the combined motives of human kindness and the practical business advantage that comes with the services of employes in the full possession of their health. If this condition is brought about it will be but following along the same line as that of the shop surgeon of the present day, a side of industrial management which is becoming common, and which is supplemented in large works by well equipped private hospitals. Already in the United States, says The Iron Age, there has grown out of this practice the employment of a regular shop physician who looks after employes when they are ill as well as when they have been injured. The best of the cotton mills of the South are said to have adopted this system as a most important element in keeping together their communities of workers.

There is also the work to the injured. In a number of Canadian industries branches of the St. John's Ambulance Association have been formed. On December 21, 1910, an Ontario branch of this association was instituted, a Dominion branch having been formed Feb., 1910. Branches have been organized in the east and western branches will now be formed.

A branch of this association was organized some years ago in the works of the John Bertram & Sons Co., Dundas, and in the C. P. R. Angus Shops, Montreal. In the latter shop it has been found to work so satisfactorily in giving first aid to the injured, that it is being extended along the whole system from coast to coast. S. A. Gidlow, the general secretary, has been establishing classes in the various shops with this in view. The objects of the association as pointed out in Canadian Machinery some months ago are:—Instruction in "first aid," and prompt assistance to those suffering from accident or sudden illness, instruction in the use of stretchers, hygiene, sanitation and relief of sick and injured.

Special attention is paid to accidents in the shops. During the six months ending July 31st last there were 2,033 industrial accidents officially reported in Canada, 656 of which were fatal. There are in Canada annually 3,000 deaths from accident, and it is estimated that there are 17,000 accidents which are not fatal. There is no doubt that many lives would be saved, much suffering lessened if the principles of first aid to the injured were generally known, and good use made of the precious minutes before the doctor arrives.

The whole matter is a question of shop economics. It is certainly to the advantage of industrial establishments to have contented, healthy men employed. And when accidents do occur, as they will sometimes in the best shops, the saving of the life of an employe or the giving of first aid assistance which will hasten his recovery and return to work, will unodubtedly help in making loyal, contented, healthy employes, who will serve the employer faithfully and with the best of his ability.

HAVE SUFFICIENT EQUIPMENT.

The writer entered a good sized shop recently, and as he passed through the shop he heard one workman greet another: "Say, Bill, let me use your vise a minute." Investigation showed that all the vises were constantly in use, and that there was considerable changing around to allow another to use a vise.

It would be interesting to calculate the cost of keeping men standing around waiting for a vise while another used it. It would not take many days' savings to pay for that vise. By not providing sufficient the price of quite a number will be lost in a year.

The question of wasted time should always be kept in mind. A careful study should be made of the requirements, and in the selection of a number of vises, or in the choosing of drills or other machinery, the elimination of unnecessary waste in the handling of work should be kept constantly in mind. It will be found, if this is done, that the cost of production will be greatly lowered.

TOPICS OF THE MONTH.

From time to time we receive letters from friends of Canadian Machinery telling how Canadian Machinery had helped them. Our circulation representatives are met courteously and assisted in interesting others in the paper. As an instance of the usefulness of Canadian Machinery to superintendents and foremen, we cite the following:

A foreman in one of Brantford's up-to-date machine shops told a represntative that he found Canadian Machinery invaluable. In order to illustrate how he made use of the paper, he described a job somewhat out of the ordinary, that came into the shop recently. He remembered seeing a similar job described in Canadian Machinery some time before, and as he kept a file of them, he readily hunted up the article which was in the "Methods and Devices" Department, and completed the work without difficulty.

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Beginning with the present issue of Canadian Machinery, a series of articles will appear monthly, touching the selection, installation, operation and efficiency of power transmission equipment. Every effort will be put forth to make the treatment of the various subjects popular and helpful to our wide circle of readers, users and operators. Power transmission is inseparably connected with manufactures of every description, and has in consequence a large claim to attention. The subject this month is "Belt Pulleys," to be followed in our February number by Rab on "Belts and Belt Drives."

SEASON'S GREETINGS.

IN the year that has passed we have made many new friends among superintendents, master mechanics, foremen, students and men interested in mechanical pursuits. Old friendships, too, have been strongly cemented, and we take this opportunity of expressing our cordial wish that the New Year on which we have entered may bring you great happiness and unlimited prosperity.

The Editors and Managers.

January 1, 1911.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

SKELETON AND SWEEP PATTERNS

By F. S. Cubbige.

When only one casting or a very few castings are required, a skeleton pattern is used or the mold is swept up by means of sweeps.

In Fig. 1 a skeleton pattern for a pipe bend is represented. First two boards are sawn out the shape of the pipe, and extending past the flanges to include the core prints, these pieces are doweled together, then circular pieces are sawn out to make up the diameter of the pipe at from 2 in. to 8 in. apart along the full length of the pipe and core prints. The flanges b b are cut out to fit over the boards a a. A strike or strickle is made the diameter of the pipe for the body, and one smaller in diameter to suit the core prints. The molder completes the pattern by filling in between the circular pieces c c c, with green sand and striking off any projecting portions of sand by means of the strickle D, and covering it with parting sand and then it is ready to be used as an ordinary wood pattern.

The core for the skeleton pattern is generally just swept up with a strickle, using a flat board cut out parallel to the

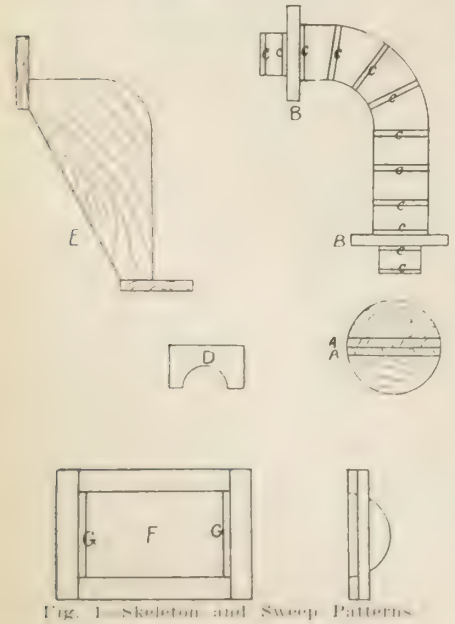


Fig. 1.—Skeleton and Sweep Patterns.

inside of pipe and strickle cut out to the diameter of the core. The board is fastened to the core plate and the core sand built on the plate so that it may be strickled, as shown at c, Fig. 1.

When making a skeleton pattern and core frame for a straight piece of pipe, the pattern is made on the principle shown in Fig. 1, a, but the core frame is generally made as shown in Fig. 1, f, and a straight strickle used over the half-circles g g, making one-half core at a time on a core plate.

When a boss or small inlet or outlet is required, a piece is turned the required shape and is secured to the circular pieces on pattern at the place where it is wanted and the green sand filled in under it between the sections. Or if an inlet or outlet piece is required on the inside of the pipe a straight piece is screwed to the ends g g, and the boss or pipe inlet or outlet, as it may be, is secured to it and the core built up and strickled the same as previously described.

In making very large pulleys or flywheels, they are very often swept up by means of sweeps, the arms and hubs being made in a core box.

Take a pulley having six arms, as shown in Fig. 2, a core box is first made for the arms. This box must be at least six inches wide, as it requires 6 in. for the one-sixth part of hub, which is included in the core box, as shown at c, Fig.2 (b) D being half of pulley arm.

It is next necessary to make a section of the rim of the pulley about 2 to 3 ft. long, the flauges E E, Fig. 2 A being screwed on. Two pieces of 1 in. stuff about 4 in. wide are then secured to rim segment, as shown in elevation, Fig. 2 (D). The distance f being the radius of the pulley required. In molding this pulley the molder first sweeps up a flat bed, a hub 12 in. diam. and 2½ in. deep is then placed in the centre and the sand built up around it, out to within about 6 in. of the outside diam. of wheel and swept level, then the hub is drawn out and the arm cores are set on the green sand, the two half-cores to make a complete arm having been pasted together. A spindle or shaft is next driven into the centre of the mold, to be used as a guide to use sweep (D) Fig. 2, the sweep being connected to spindle by means of the hole H in strips E E, Fig. 2 (D).

The sweep is then set in position and the sand rammed in from the sweep segment to the hub of pulley and up to the top of sweep at rim and to top of arm cores at centre of mold, then the sweep is moved its own length, less an inch or so around, and the operation repeated until the inside is rammed up and then the pieces E E are removed and the sand rammed up all around the outside. The sweep pattern and spindle are then drawn out and cake cores set all around the top of the rim and a core to form the top of hub is made and set on and the mold is finished. Of course, the molder has to make his own provision for gating and venting, etc., but as we

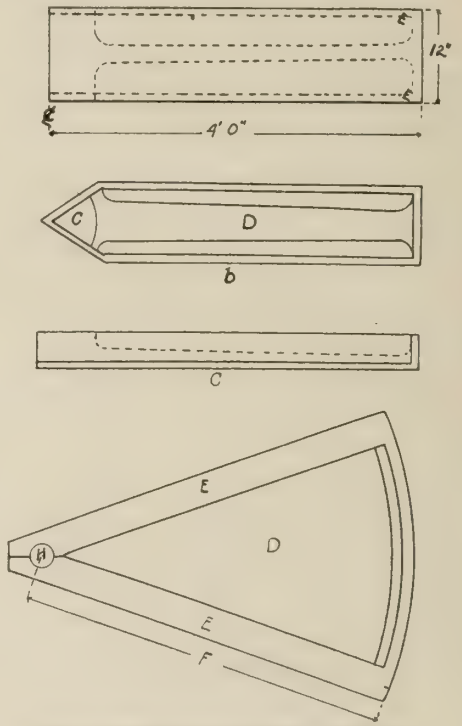


Fig. 2.—Skeleton and Sweep Patterns.

are only considering pattern work we will leave that part alone.

VANADIUM STEELS IN LOCOMOTIVE PRACTICE.

Several foundries are now specializing on vanadium steel castings for locomotive work, and in the past three years have turned out a large tonnage not only for frames, but for driving wheel centres, cross heads, cylinders, and other parts in which dynamic strength is particularly desired.

Several of the large railroad systems specified several years ago vanadium cast steel frames in a small way for trial, and are now specifying it as a standard on all new equipment. Another large system had much trouble from front end failures, but is said to have overcome the difficulty by substituting vanadium cast steel front ends with change of section.

One of the large railroad systems of this country was having an excessive number of failures of wrought iron frames and the shops were with difficulty keeping the engines in commission.

It was decided to replace sections of the wrought iron frames in the zone of breakage by pieces of vanadium cast steel welded into place. It is said that these parts never broke, but that in the same frames breaks subsequently occurred in the original wrought iron portion. Other vanadium steel sections were then welded in, and gave no trouble. It was later decided to make the entire frame of vanadium cast steel, and the service from these frames was so satisfactory that for new locomotives vanadium cast steel frames were specified.

INJURIES AND DISEASES OF MOLDERS.

The Giesserei Zeitung discusses the possibility of injuries that lie in the tapping of furnaces, transporting and pouring of molten metal, spattering and sputtering of metal, and in the breaking of cranes, conveying apparatus and cleaning of castings. The article has been translated by Castings and is reproduced herewith. If molds are not dried sufficiently, possibility of explosion enters in touching molten iron with water. This is increased by the poor lighting found in so many foundries, and the fact that near closing time more haste and less care is used by workmen. Blowing powdered carbon and coal dust on molds, envelops workmen in coal dust, while cleaners are surrounded by clouds of burned sand and coal dust or carbon when cleaning castings.

There is also the formation of gases near cupolas and influence of heat radiation. The cupola gases contain from 15 to 17 per cent. CO, and 10 to 15 per cent. carbonic acid. Usually cupolas lie at an outer wall of foundry, and the tapping hole is inside of shop, charging door is outside and a little higher. Charging should never be done directly, as insufficient ventilation and escape of gases may cause diseases through the poisonous gases. If in such an atmosphere the workman has to carry heavy charges, due to lack of mechanical conveyors, his vitality to resist these gases is lowered to the danger limit.

To avoid inhalation of dust in cleaning castings, a sand-blast with suction device is best for use. With very large castings a pneumatic scraper might be used instead. In either case, suction devices should be near cleaning tables to suck in dust at once.

Statistics for pourers and molders in German foundries show that from 40 to 50 per cent. suffer from diseases. Among these are diphtheria, tonsilitis, acute rheumatism, heart diseases, acute indigestion, acute and chronic bronchitis, and tuberculosis. Besides, they show a larger number of sufferers from eye troubles, burns, poisonings and kidney diseases. The death rate is not quite as high; causes aside from tuberculosis, being chronic kidney diseases and suicide.

In preventing burns on the feet the foot-gear plays the main role. Out of 247 cases of burns due to molten metal, 58.7 per cent. went on laced shoes, and 16.6 per cent. on low shoes.

Sommerfeld in his investigations found that out of 100 deaths and sicknesses in foundry workers, 62.5 per cent. came on organs of respiration of the pourers, 60 per cent. of cleaners. The average age of the former is 45.9 years, of the latter 48 years, showing both branches of foundry work to be equally unhealthy.

Rooms for cleaning castings should be lofty, light, broad, artificially ventilated. In winter the room for molders should be heated, as they are especially exposed to colds, handling cold and wet material. A number of accidents can be lowered if molds are not placed too closely and enough space is left between them for passage. Cleaners should wear masks or at least protection goggles. Where no suction is provided in cleaning of castings, workmen should have small respirators to prevent lungs from inhaling dust. Frequent use of soap and water should also be impressed on workmen.

PNEUMATIC TESTS OF PIPE.*

By William R. Conrad.

LAST spring two separate corporations wishing to put in some pipe lines that would be absolutely tight when laid and in service, ordered from two separate manufacturers a quantity of cast iron pipe, each purchaser specifying in addition to the usual hydrostatic test that each pipe be carefully tested with air, compressed to 50 pounds per square inch, and that while under this pressure soap and water suds be applied so as to reveal open or porous iron or defects which the hydraulic test had not developed. Because of this additional test and it being known that air will, when compressed, work through metals more rapidly than water, it was determined by the manufacturers to use nothing but the best grades of iron that would give a close and uniform texture.

The results were that in one case there were 4,954 pipes tested either hydrostatically or pneumatically; of this number 27 leaked under hydraulic pressure and 272 leaked under pneumatic pressure, those leaking under pneumatic pressure having already passed the hydraulic test; this makes a percentage of leaks of the whole quantity tested 0.545 of 1 per cent. for the hydraulic and approximately 5.5 per cent. for the pneumatic, or slightly over 6 per cent. for the two tests. In the other case there were 2,737 pipes tested, of which 14 leaked under hydraulic and 186 leaked under pneumatic pressure, the percentage being 0.511 of 1 per cent. for the hydraulic and approximately 6.8 per cent. for the pneumatic, or about 7.3 for both. Analyzing further, you will notice that the percentage of hydraulic leaks to the total number was but about 6.2 per cent. of the total number of leaks, taking both jobs together. This proportion, however, would undoubtedly have been more evenly divided had the hydraulic pressure in testing been maintained for a longer period of time per pipe, for, as previously stated, air compressed will find its way through open or porous metal more rapidly than water compressed, but in view of the fact that all of the pipes were to be subjected to an air test subsequent to the hydraulic, both manufacturers depended more on developing leaks with the air than with the water. While it is true that both lots of pipe were laid for the purpose of carrying gas, the writer believes that in these days when the tendency is with all waterworks to operate as economically as possible and with as little loss of the commodity being dealt in, for the purpose of conserving the supplies already in use to their fullest extent before looking for new sources, or in considering the most economical way of conserving new sources of supply which are being considered, we should all consider seriously whether requiring a longer hydrostatic test, or in addition to the hydrostatic a pneumatic test of the pipe we purchase and lay, would not be good economy, even at the risk of having to pay slightly more for our material. In other words, whether the best is none too good, both in material and in laying, while the first cost may seem high will it not effect economies of both operation and commodity that will eventually prove considerable of a saving?

* Paper read before Central States Water Works Association by William R. Conrad, Burlington, N.J.

The Mechanical World states that aluminum may be etched by the following etching fluid; alcohol, 4 ounces; acetic acid, 6 ounces; antimony chloride, 4 ounces, and water, 40 ounces.

Don't fail to clean away all dirt and chips before screwing a chuck or faceplate on the lathe, and if the screw is dry, put on a few drops of oil.

A rust-proofing process for iron and steel, called Coslettising, consists in boiling the articles to be treated in a solution of 1 gallon of water, 4 ounces of phosphoric acid and 1 ounce of iron filings. By this means a black coating is produced on the iron or steel surface which protects it from atmospheric or other corrosive influences.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

MONTREAL.—Two blocks have been cleared for the erection of the Canadian Tube & Iron Company's works. This company is capitalized at $1,000,000. The intention is to have the first storey completed by early summer next year, and at once some machinery will be installed and manufacturing will start, while the rest of the building is being completed. When the whole works are in operation 400 or more men will be employed.

TORONTO. The Dominion Gasoline Engine Co. has been incorporated, with head office here. The capital is $75,000, and the provisional directors are A. N. Morine, R. H. Whiteway, M. Vetter, G. N. Shaver and G. G. Paulin.

WALKERVILLE.—The Gramm Motor-truck Co., recently incorporated for $100,000, are making complete motor trucks here. The plant of the Gramm Motor-truck Company of Canada comprises some 30,000 square feet of space, and the company owns additional adjacent land in the best locality in Walkerville, which will be called into requisition as conditions warrant. The President of the company is H. W. Acason, who is also Vice-President of the Walkerville Carriage Goods Co., and a member of the firm of Acason, Galusha & Rudd, makers of automobile tops and trimmings. John V. Carr, Vice-President; I. K. Webster, Secretary and Treasurer. F. H. Galusha, the general manager, is also president of the Walkerville Carriage Goods Co., and one of the firm of Acason, Galusha & Rudd.

MONTREAL—The National Acme Co. are installing Chapman double ball bearings in their new plant here, and also in the Crown Laundry.

TILLSONBURG, Ont.—Gaskell & Co., recently from England, have purchased the machine shop and foundry of H. F. McCrea. It is the intention of the new company to do general repairing, and also manufacture some general lines, when they become better acquainted with the requirements of the country. Mr. McCrea is retiring from active work. He has been a reader of Canadian Machinery for many years and has renewed his subscription, because he still wants to keep in touch with Canadian manufacturing interests.

SUDBURY, Ont.—The Sudbury Construction & Machine Co. are building an addition to their plant to be used as a foundry. This company manufactures mining machinery.

SAULT STE. MARIE.—The Northern Foundry & Machine Co. have completed their new blacksmith shop and foundry which replace those destroyed by fire some time ago. The plant has been fully equipped for the manufacture of boilers, etc.

PORT WILLIAM, Ont.—The various foundries and machine shops are busy with contracts for the C.P.R. and C.N.R. The Canadian Iron Corporation have 300 men employed and are rushing to their full capacity.

METEGHAN RIVER, N.S.—J. P. Robichaud is building a foundry and machine shop here.

SARNIA, Ont.—The J. B. Hicks Gas Engine Co. will establish a works here subject to the ratepayers authorizing a grant of $5,000 to the company.

MONTREAL, Que.—The Lightning Furnace Co., which has taken over the assets and business of the Compagnie de la Fournaise Limitee, will establish a foundry for the manufacture of furnaces and implements connected therewith.

HALIFAX, N.S.—At a meeting of the shareholders of the Silliker Car Co., held in Halifax, on December 6, it was decided to accept the amended offer of F. E. McCurdy to purchase the assets and business. The offer includes an undertaking to put $600,000 new capital in the business. The McCurdy interests will purchase $600,000 of the first preferred 7 per cent. stock.

HAMILTON, Ont.—The Dominion Power & Transmission Co. announced on Dec. 15 that it would spend $100,000 on new sub stations in this city, $220,000 on new works at Decew Falls Development plant and $30,000 on new cars for suburban traffic.

PORT ARTHUR, Ont.—The municipal authorities have now under consideration proposals for the establishing of new industries involving a capital outlay of $1,400,000. H. S. Jones, of Winnipeg proposes to build and operate car works. The plant is to cost $400,000. A free site of 15 acres is asked. A prominent American manufacturer is asking consideration for a project to put up automobile works there to cost $500,000. A foundry project in connection with the local blast furnace is also the subject of negotiation. Mr. Jones' plant would include in its output and operations machinery, cars, railway equipment and repairs.

LONDON, Ont.—It has been announced by the chairman of the Ontario Hydro-Electric Commission that the machine shops of the commission will be located in London, that being the central point in the transmission system.

ST. THOMAS, Ont.—A proposal to establish here an industry to employ 200 hands is being considered by the City Council. A fixed assessment for a number of years is asked for. Machinery is to be put in on a considerable scale, but no further particulars are given out.

WELLAND, Ont.—At a meeting held here this week it was decided by the directors of the Niagara Falls, Dunnville, and Welland Electric Railway Co., to expend $1,000,000 on railroad construction account. Car barns and machine shops are to be erected in Welland.

ROCHE POINT, B.C.—The Vancouver Dry Dock & Shipbuilding Company will construct a large dry dock here at a cost of $1,214,154. Work to be started within six months and finished by Dec. 1, 1912.

WOODSTOCK, N.B.—The machine shop in connection with Connell's Foundry was destroyed by fire on November 28. Insurance amounted to $21,000 on the entire plant, but the loss on the part destroyed exceeds that sum.

ST. BONIFACE, Man.—The council have closed an agreement with the Taggart Iron Works, of Winnipeg, by which the company will erect a large building here, as a branch industry. Building operations are to commence within five months.

CAMPBELLTON, N.B.—The Trans-Continental Railway Co. plans to erect larger buildings here, it is reported, at an estimated cost of $200,000. G. Grant, of Ottawa, is chief engineer.

LONDON, Ont.—It is understood that the McLaughlin Automobile Co. will erect a large building here.

TORONTO, Ont.—The Mexican Northwest Equipment Co., capitalized at $200,000, has received a federal charter. The company purpose manufacturing locomotives, cars, machinery and railway equipment of all kinds. Headquarters are to be in Toronto.

WELLAND, Ont.—The Hamilton Tube Co. ask for a fixed assessment of $1,500 for 10 years on a factory and plant they propose locating here.

ST. THOMAS, Ont.—F. Doty & Sons, of Goderich, will establish a shipbuilding yard at Port Stanley and have leased property for that purpose. Building operations are to commence at once. The firm will construct large tugs and have already received contracts for three such vessels.

TORONTO, Ont.—J. Wiss & Sons Co., New Jersey, have received a permit to manufacture shears, scissors, razors, knives, etc., in Ontario, the capital used not to exceed $40,000.

GALT, Ont.—The R. McDougall Co., manufacturers of machine tools and pumps, are enlarging their works.

CARLETON, N.B.—The Union Foundry Co. propose extending their plant.

RENFREW, Ont.—Mr. McLean, of Bryson, Que., is considering the establishment of a foundry and machine repair shop here. The proposed industry would handle lighter and more difficult work than is attempted by the ordinary foundry, the repair work being made a special feature.

MONTREAL, Que.—An annex to the boiler construction shop is being erected at the C.P.R. Angus shops here. The new building will be 160 by 116 ft. and is to be used for the construction and repair of locomotive tenders.

ST. CATHARINES, Ont.—The McKinnon Chain Co. are erecting a new plant here.

OTTAWA, Ont.—The Diamond Arrow Motor Car Co. and the Modern Machine Co. have decided to unite their concerns. The manufacturing will be done at the Modern Machine Co.'s works which will be much enlarged.

Electrical Notes.

PRINCE RUPERT, B.C.—As the result of passing an electric light by-law, the sum of $66,000 will be raised to pay for a civic lighting plant.

BROCKVILLE, Ont.—Nine municipalities were represented at a meeting held here on Dec. 14 to discuss the hydro-electric power question. It was decided to open negotiations with the commission for 5,300 h.p. to be divided among the different municipalities. Those represented were Iroquois, Morrisburg, Cardinal, Prescott, Lyn, Athens, Brockville, Kingston and Napanee.

PORT ARTHUR, Ont.—On November 24 the first power to come over the hydro-electric lines from Kakabeka Falls was delivered to this city. Only a temporary supply of 600 h. p. was given; the entire service commenced on December 15.

BELLEVILLE, Ont.—The Electric Power Co. is the name of a corporation that has control of several operating power companies in the Trent River district, and is proposing large extensions into the cities and towns of that region.

WINNIPEG, Man.—The Canadian Carbon Co., of Toronto, is establishing a branch factory in Winnipeg. The "Black Cap" battery will be the main article of production.

MONTREAL, Que.—A cable from London, Eng., on December 14 announced the formation there of the Montreal Tramways & Power Co., with a capital stock of $20,000,000. It is believed that the concern has been formed to take over the Montreal Street Railway.

STRATFORD, Ont.—Among other by-laws the ratepayers will be called to vote on one providing for the expenditure of $41,610 for electric light purposes.

ROLEAU, Sask.—The contract for the construction of an electric light plant to cost $60,000 will be let at an early date.

SHERBROOKE, Que.—The city has decided to develop power on the Magog river. The plans prepared call for the development of 2,600 h.p. at an estimated cost of $70,000. Tenders are to be asked for the purchase of the power which the city owns on the St. Francis at Westbury.

TORONTO, Ont.—The Western Central Railway Co., incorporated by the Ontario Legislature, is applying for a Federal charter. It is desired to extend the electric lines provincially authorized between Toronto and London to Windsor; also to establish a ferry connection from Windsor to Detroit.

Municipal.

ST. HYACINTHE, P.Q.—The Colonial Engineering Co., Montreal, have been awarded the complete lighting and pumping equipment for this city.

CHATHAM, Ont.—The ratepayers will vote on a by-law to provide a site of 7 acres at a price not exceeding $1,500 and a fixed low assessment for 10 years for the Western Bridge & Equipment Co. The company is to erect a $10,000 plant and spend an equal sum for equipment.

Calgary, Alta.—The construction of an incinerator is being discussed by the city. Estimated cost, $50,000.

SOURIS, Man.—Tenders for delivery during spring and summer of 1911 of water pipes, hydrants, gate valves, valve boxes, pig lead, oakum, standard vitrified sewer pipe, etc., will be received until February 1st, 1911.

PEMBROKE, Ont.—A by-law will be submitted to provide by way of loan the sum of $65,000 for the extension of the waterworks system here.

GUELPH, Ont.—A by-law to provide for the expenditure of $9,800 for waterworks improvements has been passed by the city council.

VANCOUVER, B.C.—$200,000 is the amount needed for new waterworks. A by-law authorizing the expenditure of this amount will be submitted to the ratepayers.

STAFFORD, Alta.—$15,000 is the amount this town proposes to spend on waterworks.

OAK BAY, B.C.—A by-law to authorize the expenditure of $60,000 will be voted on.

KINCARDINE, Ont.—The ratepayers will vote on a by-law to issue debentures for $7,000 for sewers and $2,500 for bridges.

Saw Mill and Planing Mill News.

SCOTSTOWN, Que.—The Emberton Lumber Co. have recently sold out all of their property at Scotstown, to the East Angus Co. The Emberton Co. have had possession of the property for nearly two years.

WINNIPEG, Man.—The Security Lumber Co. has been incorporated here with a capital of $500,000. John P. Jansen and Lorne J. Elliott are named as the incorporators.

FORT GEORGE, B.C.—Timber rights on 100 sections of land, principally in the Fort George district have been purchased by British capitalists from C. E. Mahon, of Vancouver and associates, for $1,500,000. It is said that there is over 2,000,000,000 feet of fine spruce, cedar and fir on the sections. Most of this lumber land is on the Willow river, 20 miles east of Fort George.

NELSON, B.C.—The shingle mill and box factory which will be erected by the Western Box & Shingle Mills, Limited, at Nelson, will be a frame building with iron roofing. It will be 36 feet by 48 feet and 2 storeys high. The estimated cost of the building is $1,000, and the machinery $4,000.

QUATSINO, B.C.—Arrangements have been made for the building of a saw mill at Quatsino, this winter. Behind this enterprise are James Guyer and Gustave Moerman, both residents of Quatsino. The mill men will start in a small way, catering principally to the home market.

FORT FRANCES, Ont.—The Shevlin-Clarke Lumber Co. propose erecting a large mill here and ask for a fixed assessment. This company is interested in the Rainy River Lumber Co. and the Shevlin-Mathieu Co.

BAY OF ISLANDS, Nfd.—The Humber Lumber and Pulp Co. is preparing to add to its works a very large pulp mill at Bay of Islands.

RIDGEWAY, Ont.—E. W. Near is erecting a two-storey addition, 28 by 56 ft., to his planing mill. On the ground floor will be offices and engine room. The upper floor will be used as a joiner shop.

VANCOUVER, B.C.—The Paterson Lumber Co. proposes to build manufacturing works to cost $250,000 to $300,000 in Vancouver, in connection with its existing business.

BRIGDEN, Ont.—The Dominion Cooperage plant and stave mill was completely destroyed by fire on November 30. Loss is $14,000, partly covered by insurance.

VICTORIA, B.C.—A new lumber mill, owned by the Vancouver Island Mining and Development Co., is in operation at Tyee Siding on the Esquimalt & Nanaimo Railway. The mill has a capacity of from 25,000 to 30,000 ft. per day.

NANAIMO, B.C.—Walter Marriott has purchased from Dickie, Van Norman, Haycroft and J. W. Vipond, of this city, their interests in the Quamichan Saw Mill Co. A joint stock company has been organized to take over the holdings.

WELLAND, Ont.—John E. Cutler, whose planing mill was recently destroyed by fire, is asking for a fixed assessment of $1,000 for 10 years, under which conditions he will erect a new mill.

ST. BONIFACE, Man.—The lumber mill of the Rat Portage Lumber Co. here, was burned on December 7. The loss amounted to $90,000 of which 75 per cent. was covered by insurance. The plant will be re-established at once, new machinery having been ordered.

RAINY RIVER, Ont.—The mill of the Rat Portage Lumber Co., which was burned some months ago during the forest fires, will be rebuilt early next spring.

MONTREAL, Que.—The sash and door factory owned by Phillipe Saumure was destroyed by fire on November 16.

HUMBERSTONE, Ont.—S. J. Dickinson's planing mill was totally destroyed by fire on November 25. The loss is $7,000, of which only $500 is covered by insurance.

ST. JOHN, N.B.—The cooperage plant of Taylor and White, here, was recently damaged by fire to the extent of $5,000. The plant was insured for $7,000.

ST. JOHN, N.B.—J. J. Gordon is completing a plant at Coldbrook, three miles from this city, for the manufacture of excelsior.

General Manufacturing.

BLENHEIM, Ont.—G. A. Fraser, of Thamesville, is considering the location of a canning factory here.

PETROLEA, Ont.—The 3-storey flour mill owned by W. W. Paing, of this town, was destroyed by fire on November 17. Total loss, $10,000.

GALT, Ont.—The C. Turnbull Co., woollen manufacturers, purchased two valuable pieces of property on King street, and will, it is stated, next year build a large extension.

HAMILTON, Ont.—In the spring the Diamond Flint Glass Co. will erect a large glass factory on a 10-acre site obtained for it in Hamilton by the Publicity Commisioner. When the new factory is completed the company will vacate its present premises in the city. It is also announced by the commissioner that the Egg-O Baking Powder Co. will establish works in Hamilton, and that the Robinson Box Mfg. Co., of Lowell, Mass., will do likewise. It is said that new factories of an aggregate value of $4,000,000 have been secured for Hamilton within the last twelvemonth.

MEDICINE HAT, Alta.—The Alberta Clay Products plant was formally opened on Nov. 26. Among the products of this plant are sewer pipe, fire roofing and all hollow wares of that class, every variety and grade of brick. Raw material can be handled to the amount of 600 tons per day.

FORT WILLIAM, Ont.—The Board of Trade has been in correspondence with a representative of Ely Bros., London, Eng., manufacturers of high-grade ammunition, who are favorable to locating a Canadian plant in this city.

MONTREAL, Que.—The Dominion Box and Package Co., which is capitalized at $700,000, will employ upward of 200 men. It is said to be a merger of several smaller companies, such as the Dominion Wire Bound Box Co. and the Montreal Box Co. It is also closely allied with Wm. Rutherford and Sons.

BOWMANVILLE, Ont.—The Goodyear Tire & Rubber Co., of Akron, Ohio, has purchased the business and plant of the Durham Rubber Co., of Bowmanville, Ont., and are now manufacturing a complete line of rubber products in Canada. From Van Bever, Vice-

Salesmanship Course Free
and a Liberal Salary

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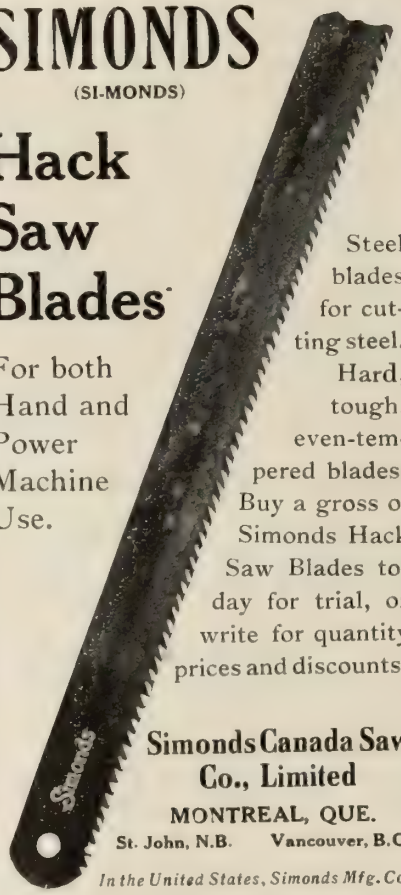
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THE HOME OF **The John Morrow Screw**

LIMITED

INGERSOLL ONTARIO



President of the Canadian company, it is learned that his firm has branches in Toronto, Winnipeg, Montreal and Vancouver, and are opening additional ones in St. John and Calgary.

Building Notes.

ST. THOMAS, Ont.—The management of Alma College have decided to have a new wing erected, or a separate building at an approximate cost of $30,000.

SARNIA, Ont. The Board of Education have made a requisition to the council for the sum of $45,000 for the erection of a new school on the site of the present Lochiel street school.

PORT ARTHUR, Ont.—The city of Port Arthur has decided to erect a new collegiate institute at a cost of $125,000.

MONTREAL, Que.—The Canada Rubber Co. on December 19 obtained a permit for the erection of a factory to cost $250,000.

VANCOUVER, B.C.—The Vancouver Gas Co. is preparing to build a new plant on deep water frontage.

WELLAND, Ont.—New industrial buildings nearing completion are the Chipman-Holton Knitting Factory and the Peters Textile Factory. The new offices of the Ontario Iron & Steel Co. are also about finished.

New Companies.

The South Shore Gas Co., Montreal, Que., capital stock $100,000; to manufacture, buy and sell gas and electricity for lighting, heating and motive purposes. Montreal parties are named as incorporators.

National Hydro-Electric Co., Montreal, Que., capital stock $1,000,000; to carry on business of an electric light, heat and power company. Montreal parties are named as incorporators.

Canadian Electric Automatic Machines, Limited, Ottawa, Ont.; capital stock $225,000; to secure patent rights for automatic vending machines and to manufacture or deal in machinery and devices connected therewith. Ottawa parties incorporators.

The Granby Elastic Web Co., Granby, Que.; capital stock $50,000; to manufacture all kinds of rubber goods and webbing. G. H. Boivin, of Granby, is one of the incorporotors.

The Central Canada Power Co., Toronto, Ont.; capital $10,000,000; to carry on hydraulic and electrical power business in Canada. Members of a Toronto legal office are named as incorporators.

The Dominion Instantaneous Heater Co., Vancouver, B.C.; capital stock $100,000; to manufacture and purchase the selling rights of Gray's Instantaneous Heater. W. Francis, E. V. Chevalier, A. C. Brydon-Jack and E. B. Ross, of Vancouver, and A. P. Francis, of Victoria, are the incorporators.

Certificates of incorporation have been granted by the legislature of British Columbia to the Canadian Dry Battery Co., Electrical Advertising Co. and the International Lead & Iron Co.

The Loomis-Morden Cooperage Co., Trenton, Ont.; capital $30,000; to manufacture cooperage products, woodenware and lumber. Incorporators are Chester Loomis, H. B. Loomis and W. A. Morden.

Canadian Explosives, Limited, Montreal; capital $15,000,000; to manufacture all kinds of explosives, ammunition, firearms, etc. Incorporators nominally given as clerks in a Montreal law office. The Company has power to amalgamate other similar companies.

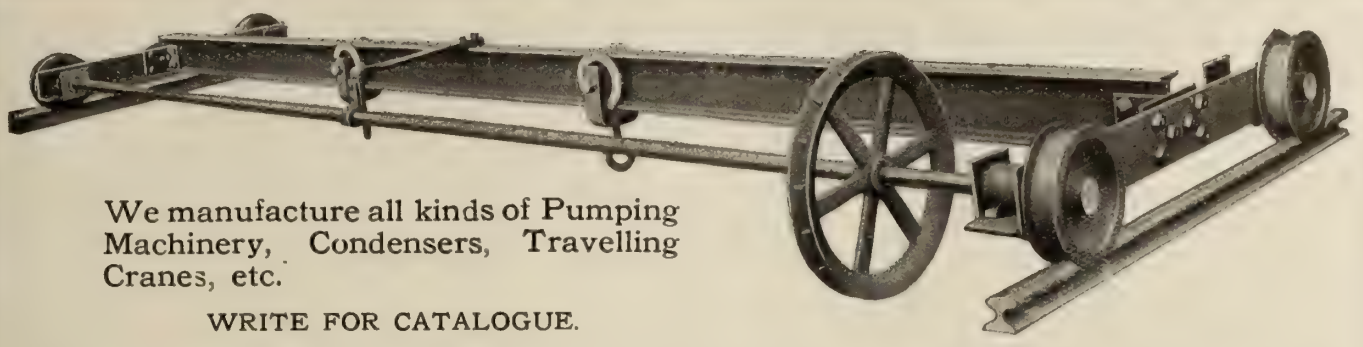
The Dryden Timber & Power Co., Dryden, Ont., have been incorporated with a capital of $3,000,000. The incorporators are: F. Singer, G. Waters and H. Hill, all of Toronto, Ont.

Trade Notes.

MONTREAL, Que.—John Watson & Son, architectural iron works, have been awarded the contract for the architectural iron work in connection with the large office building being erected by the Dominion Express Co. in this city. Contract runs to about $35,000.

HAMILTON, Ont.—The Smart - Turner Machine Co., 191 Barton St., East, report the following sales for their pumps: Flamand Frere, St. Agapit, P.Q.; Canada Preserving Co., Hamilton; Merchants Rubber Co., Berlin; Great Lakes Dredging Co., Port Arthur; Monarch Knitting Co., St. Catharines; Toronto Wire Co., Oakville; Brown School, Toronto; The Pure Milk Co., Hamilton; Toronto & York Rafial Ry., G.T.R., Lake Superior Jct.; Geo. F. Webb, Hamilton; Canadian Refining & Smelting Co., Orillia; Wolverine Milling Co., Drumbo; and J. C. Wilson & Co., Lachute Mills, P.Q.

SHERBROOKE, Que. East Canada Power & Pulp Co., of Murray Bay, have placed an order with the Sherbrooke Machinery Co., of this city, for their complete wet machine equipment. They have also adopted the Sherbrooke Machinery Company's pneumatic



We manufacture all kinds of Pumping Machinery, Condensers, Travelling Cranes, etc.

WRITE FOR CATALOGUE.

The Smart-Turner Machine Co., Limited, Hamilton, Canada

No Lost Motion

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Jeffrey Machinery



Bucket Elevator

Every detail has been carefully worked out to give maximum capacity with least frictional resistance.

Jeffrey Elevators and Conveyers are adapted to meet necessary requirements.



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Write for our Catalog 81. State how you are handling your materials and simply say you want our suggestions.



Barrel Elevators

The Jeffrey Mfg. Co.

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Branch Offices in the leading commercial centres of the world.

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How many mill owners have warded off the thought of buying a Locomotive Crane for handling of their logs and dimension timbers, thinking the equipment a LUXURY? Later you would be surprised at the great number of these same mill owners who, after seeing their smaller competitor install a "BROWNING," have investigated and found the outfit a NECESSITY and a money-saver instead.

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BABBITT METAL

but the cost of your many shut-downs caused by the use of inferior Babbitt Metal. Use THE CANADA METAL CO.'S METAL and stop that needless expense.

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Unless you have special appliances, you can get these tools from us better and cheaper than you can make them.

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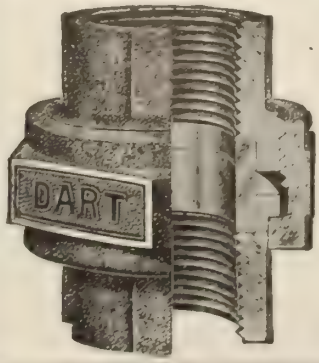
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Particularly adapted for small, quick work, to take place of foot presses.
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"DART" UNIONS



can be connected or disconnected with amazing speed, whether pipes are in or out of alignment. They never leak Both sections are sealed with non-rusting, non-corroding, smooth-ground bronze and meet in a ball joint that is perfectly tight against steam, air, gas, oil and water.

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DART UNION CO., Limited
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"save-all" system as well as their pneumatic filtering system.

TORONTO, Ont.—The Chapman Double Ball Bearing Co. have recently received orders for their type of bearings for the addition to the Ideal Bedding Co. and for new plant of Mendelessohn Piano Co., Toronto; new forge shop, Verity Plow Co., Brantford; Amherst Boot & Shoe Co. and Canadian Car and Foundry Co., Amherst, N.S.

WOODSTOCK, Ont.—The Maximilian Pneumatic Tool Co. are installing machinery, an order having been placed with the A. R. Williams Co., Toronto, for machine tools amounting to $30,000. The company will soon be manufacturing a full line of riveting and Chipping hammers, sand rammers, air motors, air compressors, etc. J. R. Porter, Buffalo, is president of both the Canadian and U.S. Companies. The company is incorporated in Ontario for $100,000.

MONTREAL, Que.—The Canada Ford Co., owing to pressure of space have removed from their offices in the Canadian Express Building, and will hereafter occupy the entire building at 485 St. James Street (a few doors west of Inspector Street) Montreal, where they will carry a complete line of the products of the Brush Electrical Engineering Co., Loughborough, England, as well as ventilating fans and blowers, transmission material, machine tools and engineers' small tools and special machinery, etc.

TORONTO, Ont.—The Lancashire Dynamo & Motor Co., of Toronto, have been authorized by provincial legislation to engage in the manufacture of dynamos, motors and appurtenances. Heretofore the company has been but a distributing agency of the British company.

MONTREAL—Orders for transformers for the Hydro-Electric power sub-station at Port Credit, were secured by Allis-Chalmers-Bullock.

HAMILTON.—The Canadian Westinghouse Co. provided the switching equipment for the Hydro-Electric Power and sub-station at Port Credit

DETROIT.—The Northern Engineering Works are installing four Northern cranes ranging from 5 to 15 tons capacity in the plant of the Kewanee Boiler Co., Kewanee, Ill.

TORONTO.—Announcement is made of an important change in the management of the Goldschmidt Thermit Co., of 90 West Street, New York, and who have a branch here. Commencing October 1st, E. Stutz, vice-president and general manager, retires from the direction of the company, which passes under the management of William C. Cuntz. Mr. Cuntz brings to his position a thorough knowledge of the steel business and a wide acquaintance with the railway and street railway officials of the country, having been connected for eighteen years with the Pennsylvania Steel Co.

HAMILTON.—The Smart-Turner Machine Co., 191 Barton St., East, report the following orders for their pumps of which they make several types: Deloro Mining & Reduction Co., Dolero, Ont.; Thos. A. Ivey & Sons, Port Dover; Gunns, Ltd., Toronto; Beardmore & Co., Acton, Ont.; Royal Crown Soap Co., Vancouver; Dresden Canning Co., Dresden, Ont.; S. L. Snively, Nelles Corners, Ont.; Peoples' Ry., Berlin; General Hospital, Toronto, and A. Dobson, Beaverton. A traveling crane is being supplied to the C.P.R., Winnipeg, and one to the Ouiatchouan Falls Paper Co., Ouiatchouan, P.Q. The Oliver Chilled Plow Works have placed orders for two tumbling barrels with the Smart-Turner Machine Co.

Western Steel & Iron Co.

The Western Steel & Iron Co., Winnipeg, has become the successor to the Western Iron Works, of that city, with considerably increased resources. It proposes to manufacture ornamental and architectural iron work, forgings, castings, railroad and contractors' materials and specialties on an extended basis. The officers of the company are: President, C. M. Simpson; vice-president, Alex. Simmers; manager and secretary-treasurer, H. R. Eade.

New Machinery Agency, Montreal.

Foss & Fuller is the name of a new machinery house who have opened at 329 St. James Street, Montreal, comprising Geo. F. Foss, who was for four years a traveling salesman for Williams & Wilson, Montreal, and M. A. Fuller, who was connected with the Canadian Rand Drill Co., of Sherbrooke. They have secured the agency of some prominent Amer-

WHITE METAL
PRESSURE DIE
NO MACHINE WORK NECESSARY—WRITE FOR FACTS
LUMEN BEARING CO., TORONTO

BETTER RESULTS AT LOWER COST
can be secured for any class of castings by arranging your mixtures by analysis. Years of practical experience in foundry work are at your service when you consult with
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18 SATURDAY NIGHT BUILDING, TORONTO
EXPERT FOUNDRYMEN, METALLURGISTS, CHEMISTS
TESTS OF METALS, FUELS, CORES, OILS, Etc., AT REASONABLE PRICES.

BEST LEATHER BELT MADE
THE J.C. McLAREN BELTING CO. OAK EXTRA TANNED EST 1856
TORONTO
ST. JOHN, N.B.
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ESTABLISH A MODERN TAX-FREE ALCOHOL DISTILLERY
We have a Good Proposition for Motor Mfrs.

Having exported our Stills in large amounts for many years, and already having several far Eastern agencies we are now open to establish additional agencies and invite correspondence to that end, looking after our old customers and prospective buyers by special successful demonstrative methods for making Alcohol, Apple Jack, Aguardiente, Mescal, Teguila, Peach Brandy, Whiskey, etc. Most modern and simple. All sizes, 5 to 500 gallons daily capacity distilling apparatus.
ARE YOU LOOKING FOR information relating to INDUSTRIAL or DENATURED ALCOHOL DISTILLING APPARATUS and the amazing possibilities of the utilization of waste farm products and wood waste by superheated steam distillation, the distilling apparatus as used by us; the principle involved, also the methods of chemical control and disposal of the product and by-products? We will gladly say to you:
Denatured Alcohol to-day is of the greatest untold benefit to the American motor people. It opens an absolutely new field for investment for progressive paper pulp and chemical fibre mills, paint, varnish, soap and candle makers, gardeners, farms and garbage plants, saw-mills, lumbermen and canneries. The Automobiles and the Navies of the world clamor for this new tax-free cheaper industrial alcohol. May we expect some encouragement from the more patrotic pioneers for this new American Industry? The field is new and profitable, and you can practically have the business your own way by starting now. We are makers of an apparatus for the production of this denatured or industrial alcohol; we build and install plants—large or small. The initial cost of a plant is small; the financial risk—if any—is trifling. The equipment is such that it can be added to at any time without disturbing the original installation. Address
THE WOOD WASTE DISTILLERIES CO., Inc.
WHEELING, W. VA., U.S.A.

ican manufacturers, amongst others:—Schumacher & Boye, Lathes, Cincinnati; Geo. A. Gray, Planers, Cincinnati; Mueller Machine Tool Co., Radial Drills, Cincinnati; The J. T. Slocombe's line of Micrometers and the O.K. Tool Holders.

A. R. Williams Co. in New Brunswick.

The A. R. Williams Machinery Co. have been incorporated in New Brunswick and will open up a branch in St. John, N.B. The incorporators are A. R. Williams, Thomas A. Hollinrake, Toronto; M. W. Doherty, St. John; F. W. Kischel and Robert Kerr, Brantford. The capital is $99,000, of which $50,000 is paid up. The St. John manager is M. W. Doherty. A large building in St. John has been purchased. Stocks of machine tools, wood-working machinery, boilers, engines, saw mill machinery, belting, etc., will be carried.

Toronto Agency Northern Cranes.

A Toronto office of the Northern Engineering Co., Detroit, and their Canadian branch, the Advance Machine Works, Walkerville, manufacturers of Northern Cranes, has been opened up at room 623 Traders Bank Bldg. The office is in charge of W. P. Robinson, who will also represent the Canadian Crocker-Wheeler Co., manufacturers of electrical machinery; American Electric Fuse Co., Muskegon Heights, Mich., manufacturers of controllers, starters, etc., and Hooven, Owen, Rentschler Co., Hamilton, Ohio., manufacturers of Hamilton Corliss engines.

Manufactures Dies in Montreal.

An item appeared in the November issue of Canadian Machinery with reference to the demand on the part of many small manufacturers for dies for punching brass, metal, etc. Ernest Scott, 145 Bleury Street, Montreal, writes us that he is a manufacturer of all kinds of dies of this nature and in a position to submit prices on all work of this kind.

Montreal Branch, Thos. Firth & Sons.

Thos. Firth & Sons, of Sheffield, England, have opened up a branch office and warehouse at 507 St. Paul Street, Montreal, where they intend carrying stock of their tool steels, etc. The business is under the management of J. A. Sherwood, formerly of Pittsburg, who has had a long and sucessful experience with the company.

Massey-Harris Co. Enlarging.

The Massey-Harris Co. have bought out the works of the Johnston Harvester Co., Batavia, N.Y. The Massey-Harris Co. are enlarging their Toronto and Brantford plants, having secured additional property adjacent to these plants. The buying of a plant in the United States is to assist in taking care of their foreign trade.

Pumps for N.T.R. Shops.

The John McDougall Caledonia Iron Works Co., Montreal, are furnishing a number of pumps for the N.T.R. shops at Transcona, near Winnipeg. These consist of two 8-in. single stage horizontal turbine pumps, with extended bases. Each of these pumps is direct connected on the same base with an 18 in. six-stage 70 h.p. horizontal Kerr Steam Turbine, running at 1,500 r.p.m. The capacity of each of these machines is 1,200 U.S. gallons per minute when operating against total head of 150 feet. The pumps were manufactured in Montreal, and the turbines were made by the Kerr Turbine Co., Wellsville, N.Y.

Two 14x10¼x10 Blake horizontal duplex piston pattern boiler feed pumps, mounted on cast iron bedplates. Each of these pumps will have capacity of 200 U.S. gallons per minute and used for supplying boilers operating under 150 lbs. steam pressure.

Two 6x4¼x3x36 Blake vertical Artesian Well Pumps. Each of these machines are used to draw water from 6 in. diameter Artesian wells and deliver to a high level tank at an elevation of 120 ft. above ground level, and will have capacity of 40 U.S. gallons per minute when operating under the above conditions. These latter pumps are manufactured by the George F. Blake Mfg. Co., East Cambridge, Mass.

One 26-in. Vertical Centrifugal Pump, direct connected to one 350 h.p., 450 r.p.m., 3 phase, 60 cycle, 550 volt, type "F" Motor, complete with cast iron base and thrust bearing to take care of the weight of the rotor only. This pump is designed to have capacity of 16,000 Imperial gallons per minute against total head of 48 feet, and will have an efficiency of 70 per cent. when operating under the above conditions and running at a speed of 436 r.p.m. The motor will be controlled by Cutler-Hammer 350 h.p. automatic motor starter, complete with ball, float, chain and switch. It will also be supplied with hand-operating controller and resistance. There will also be supplied in connection with this

MALLEABLE IRON CASTINGS
PRATT & LETCHWORTH CO.
BRANTFORD ONTARIO

The British Aluminium Co., Limited
LONDON, - ENGLAND

Beg to announce THE OPENING on October fifteenth, 1910, of their new

Canadian Headquarters, at 24 Adelaide St. W., Toronto

in charge of

MESSRS. PARKE & LEITH, General Agents for Canada

A Large Stock of Aluminium in all the Commercial Forms will be kept—Wholesale and Retail.

JESSOP'S Best Tool Steel
"ARK" High-Speed Steel

THE FAVORITE BRANDS WITH USERS OF GOOD STEEL.
A LARGE ASSORTMENT OF SIZES IN STOCK.
JESSOP'S HIGH-GRADE FILES AND RASPS.

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Chas. L. Bailey, Agent.

Jas. Robertson Co., Ltd
Montreal, Quebec

Reid-Newfoundland Company
St. John's, Newfoundland.

Jas. Robertson Co., Ltd.,
St. John, New Brunswick

WM. JESSOP & SONS, Limited, Manufactory, SHEFFIELD, ENGLAND.



Crucibles are part of the expense of your foundry. It will pay you to be sure you're using the best.

Dixon's Crucibles

have a record of 83 years behind them. You will find them adapted to your melting.

Free booklet, 223-A, sent on request

JOSEPH DIXON CRUCIBLE COMPANY
JERSEY CITY, ... N.J., U.S.A.

outfit a motor panel to mount the following instruments:—

One 400 amp. 3 pole single throw automatic oil switch.
One 500 amp. Weston Ammeter.
One 600 volt Weston Voltmeter.

This panel will be made of Blue Vermont Marble, complete with frame work and connections.

One 8-inch Centrifugal Sewage Pump, direct connected to 30 h.p. motor with Cutler-Hammer starting controller and resistance, complete with float switch and float ball and chain. This outfit will have capacity of 2,000 Imperial gals. per minute when operating against total head of 15 ft. The pump will have an efficiency of 56 per cent. when operating at a speed of 436 r.p.m. This outfit will also have a motor panel with the following instruments mounted on same:—

One 50 amp. type "E" automatic oil switch.
One 60 amp. Weston Ammeter.
One 600 volt Weston Voltmeter.
All complete with frame work, etc.

The pumps will be manufactured in the John McDougall Caledonia Iron Works at Montreal and the Allis-Chalmers-Bullock, Montreal, are supplying the electrical apparatus.

All the centrifugal pumps will be designed under the supervision of Consulting Engineer, William Clinton Brown, formerly chief engineer of Henry R. Worthington, New York.

$7,000,000 of Equipment Ordered by C.P.R.

Over $7,000,000 worth of new cars and train equipment has been ordered by the C.P.R., all to be delivered by next summer. Two thousand refrigerator, coal, box, and other class of freight cars, and 200 coaches for passenger train equipment, including baggage, express, sleeping, dining, parlor and observation cars are at present under construction at the company's Angus shops, and, besides these, orders have been placed with other firms for 2,000 steel frame box cars of 80,000 lbs. capacity, to cost over two million dollars. Five hundred stock cars and 800 flat cars have also been ordered from outside. Orders for seventy-five heavy locomotives have also been placed in Canada, at the Angus shops, Kingston, and Montreal Locomotive Works.

The policy of the Canadian Pacific Railway indicates that they are planning to cope with any business that may be offered, with ample equipment built by Canadian workmen. They have never lacked confidence in the rapidly growing trade of Canada and the great transportation possibilities of the country's future.

CATALOGUES.

Steel and Wood Pulleys—The Oneida Steel Pulley Co., Oneida, New York, have issued a 48-page, 6x9 ins., illustrated catalogue of steel and wood pulleys and other specialties.

Calendar.—J. R. Baxter, 102 St. Antoine St., Montreal, have published an attractive calendar for 1911, which they are sending to their customers and friends.

Graphite Products for Railroads.—A new booklet has just been issued by the Joseph Dixon Crucible Company, of Jersey City, N.J., under the above title. This, as its name implies, covers the Dixon line of products that the widely used in railroad service.

The object of the book is to bring under one cover all the various products in the Dixon line that are of interest to the various mechanical departments of railroads. These include various graphite lubricants, protective paint, crucibles, facings, etc., all of which have been found by actual service to give satisfactory results.

The booklet runs to 40 pages, and is quite attractively illustrated by means of photographs showing different views of railroad stations and yards, different types of locomotives, stretches of track, signals, bridges, etc. If you are interested in the use of any graphite products about the railroad, you should write for copy of this booklet, which will be sent free to those desiring it.

Electrical Machinery.—Paper, 10x8½ ins. Crocker-Wheeler Co., Ampere, N.J.

These bulletins are prepared for filing: Bulletin No. 120, 16 pp.—Form I motors, belt D. C. 3¾ to 50 h.p.; generators, 3 to 45 K.W. Bulletin No. 122, 8 pp.—Form D machines, belt type D. C. motors, 25 to 300 h.p., generators, 45 to 250 K. W. Bulletin No. 123, 16 pp.—Adjustable speed motors, ½ to 32 h.p.; speed ranges, 2:1-2.5:1-3:1; eleven frame sizes. Bulletin 125, 8 pp.—Reinck type transformers for light and power.

Fine Tools.—The L. S. Starrett Co., Athol, Mass. Catalogue No. 19. Size 5⅛x7½ in.; pages, 274. Describes and illustrates a very complete line of fine mechanical tools, which includes a number that have been added since the previous edition was published. Brief

ARMSTRONG BROS.
16 Sheppard St., Toronto
Mfrs. of SPECIAL MACHINERY
Patents Perfected
GEAR CUTTING, TOOLS, DIES, ETC.
Ruching and Pleating Machinery.

ERNEST SCOTT
91 BLEURY ST, - MONTREAL
Machinist and Tool-maker
Dies for sheet metal work. Stampings and light manufacturing. Special machinery designed and made to order.

The PARMENTER BULLOCH CO., Ltd.
GANANOQUE, ONT.
Iron and Copper Rivets, Iron and Copper Burrs, Bifurcated and Tubular Rivets, Wire Nails Copper and Steel Boat and Canoe Nails, Escutcheon Pins, Leather Shoe and Overshoe Buckles, Felloe Plates.

OWEN SOUND IRON WORKS, LIMITED
OWEN SOUND, ONT.
Cement Mill Machinery, Boiler and Steel Tank Work of all kinds, Grey Iron and Brass Castings

Oil Tempered Steel Springs
—for every purpose and the best for each use.
—Special styles of all kinds to order.
THE CLEVELAND WIRE SPRING CO.
Cleveland, Ohio.

MAPLE LEAF
STITCHED COTTON DUCK
BELTING
DOMINION BELTING CO. LTD.
HAMILTON CANADA

specifications are given, and a number of tables of useful information completes the catalogue. The customary system of marginal numbers has been retained and both numerical and alphabetical indices render it a simple matter to locate any tool quickly.

Screw Machines. The National-Acme Mfg. Co., Cleveland, Ohio. Calendar. Size 12x15 in. Each of the 12 leaves in addition to giving the calendar for one month contains an illustration either of a screw machine or some of its products. Among these are the multiple spindle screw machine and some products of the screw machine milling attachment.

Handling Coal.—Bulletin No. 42 from the press of the Jeffrey Mfg. Co., Columbus, O., is entitled "Coal Handling and Mine Equipment," and is a 48-page catalogue descriptive of this line of machinery. This book, which is larger than the usual Jeffrey publication, describes the Jeffrey Coal Tipple, illustrating a number of recent installations. In addition, numerous illustrations from their minor pamphlets, describing other coal handling machinery, giving the pamphlet number where more detailed information is to be had. It serves as a review book of their coal handling machinery.

Celfor Tools.—Catalogue No. 10, of the Celfor Tool Co., Railway Exchange, Chicago, Ill., a handsome 30-page booklet, describing their line of drills, chucks, shanks, reamers, 3-lipped drills, sockets for reamers and 3-lipped drills, and Rich flat drills and chucks. Besides describing and listing their respective prices, in a comprehensive manner much useful information concerning drill and reamer speeds, etc., and additional tables are given. The Celfor drills and reamers are made from flat high speed steel bars, twisted to shape, and in catalogue they are illustrated in operation.

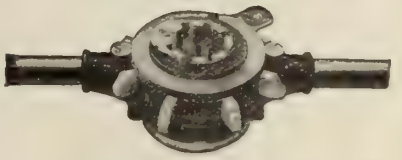
Standard Automobile Gauges.—This line as manufactured by the Industrial Instrument Co., Foxboro, Mass., is described in their bulletin No. 36, a 4-page folder. As well as briefly describing the gauge and its features, its varied uses on an automobile are given, showing that it would be to the advantage of automobile owners to have them.

Multiple Drilling Machines.—Section B of the 1910 series of catalogues, entitled Modern Machine Tools, issued from Webster & Bennett, Ltd., Coventry, England, is a 32-page booklet, descriptive of this line of tools, and gives a large variety of the different multiple drilling machines that they manufacture, enumerating the salient features of each as well as their size, weights, etc. Among the machines are various types of drilling machines, combined drilling and boring machines, combined drilling, boring and tapping machines and sensitive drilling machines.

Motors.—Continuous current protected and ventilated motors are dealt with in the 4-page leaflet No. 9, from S. W. Broadbent, Ltd., Huddersfield, England. The principal parts of the machine are briefly described, and the original features dwelt upon. In addition, is a general description of the machine, and a list, which includes prices, and data concerning a number of different sized machines.

Series Arc Lighting System.—With Cooper Hewitt Rectifier. This is the subject of Circular No. 1155, of the Canadian Westinghouse Co., Ltd., Hamilton, which is a 32-page booklet descriptive of this system of lighting. The system in detail is fully explained,

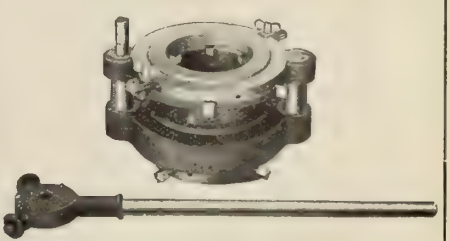
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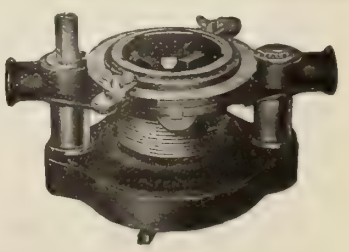


No. 25B, 1 in. to 2 in., R.H. complete.



No. 60, cuts 2½, 3, 3½, 4, 4½ 5, and 6 inch pipe.

NOTE—That with the three tools shown above you can thread from 1-4 in. to 6 in. pipe. No loose parts.



No. 41, cuts 2½, 3, 3½ and 4 in. pipe.

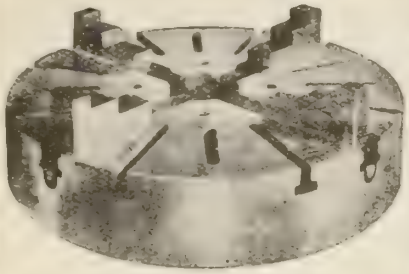


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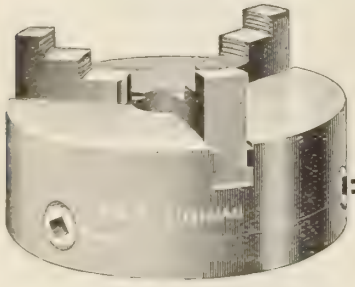
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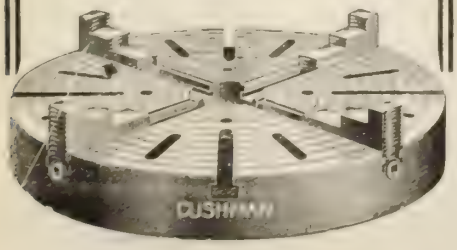


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with all the auxiliary apparatus, making in all a very instructive booklet on lighting.

Radial Drills.—The 2½, 3 and 3½ foot arm, simple type radial drill, manufactured by the Mueller Machine Tool Co., Cincinnati, O., are described on leaflets just issued by that company. They are machines which they are making in conjunction with their standard radial drills. Special reference is given to the general dimensions, and also the salient features pertaining to the column, arm, head, tapping mechanism, feed, spindle, depth gauge and automatic trip, base, plain square box table, and motor. Excellent cuts of the drills with arrowed description are given in the pamphlets.

Hack Saw Blades.—Catalogue No. 16 of the Diamond Saw and Stamping Works, Buffalo, N.Y., is a 16-page booklet, attractively gotten up. In it are described and listed the various lines of "Sterling" hack saw blades, frames, power machines, etc. The advantages of the different lines are set forth, and the kinds best suited to the various lines of work are given. An accompanying 4-page leaflet describes their 3 sizes of high speed power hack saw machines, and includes the results of a production test.

Small Tools and Machinery.—The catalogue of the Hamilton Tool Co., Ltd., Hamilton, Ont., describes their line of small tools and machinery. Among the articles enumerated are Beaver drills and collets, ball bearings, milling cutters, reamers, slotting saws, sensitive drill, and bench drill. In addition are a list of letters of commendation from satisfied patrons. The articles shown are listed in a very convenient manner for ready reference. Much useful matter is contained, as the Beaver collet, especially, is described in considerable detail.

Blowers.—The American Blower Co., Detroit, have issued bulletin No. 286, entitled "Blower Equipment for the Modern Foundry." An excellent article on heating and ventilating the foundry, is given, dealing with that subject at some length, showing how their blowers can be used to advantage. In addition are articles or blowing equipment, exhaust systems, ABC forge blower, ventilating apparatus, mechanical draft apparatus for steam boilers, and ABC vertical enclosed self-oiling steam engines. An additional article at the back of the book gives some interesting figures on comparisons of isolated lighting plant cost with central station service.

Money and Labor Savers.—Is the title of a large 12 double page catalogue of neat design, issued by Walter MacLeod & Co., East Pearl St., Cincinnati, O. As the cover states, it is for the busy man who has not time to wade through a large catalogue, and for that reason is made very concise, containing no reading matter whatever, only titled illustrations, of which there are several dozen, of a good size. Fuller catalogues of the various machines are also to be had. Among the articles illustrated are the Buckeye lead and babbitt meltin furnaces, heater for foundry, heaters of general types, carbide lights, kerosene lights, locomotive and car tire heaters, weed burners, oil furnaces and forges, water softening plants, paint and whitewash sprayers, and sand blasts. For ready reference, it is extremely handy.

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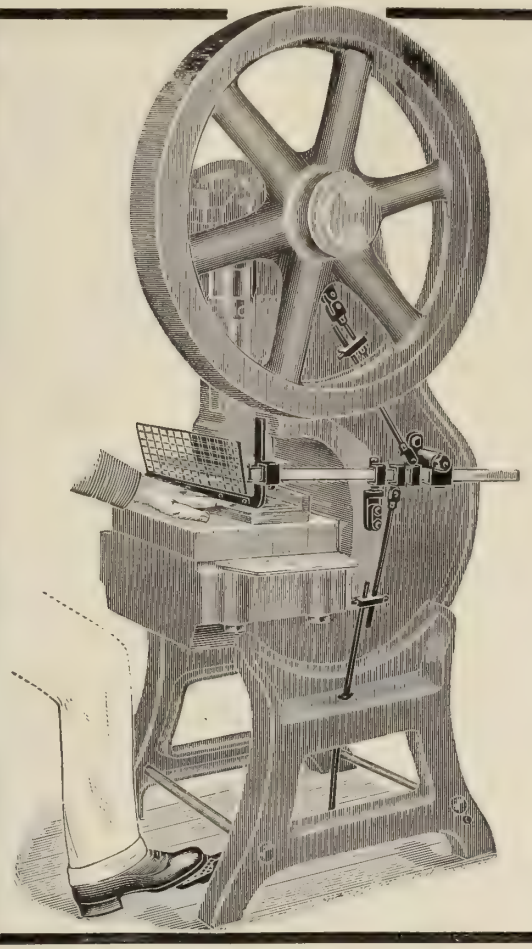
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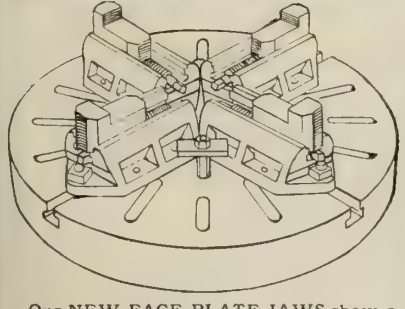
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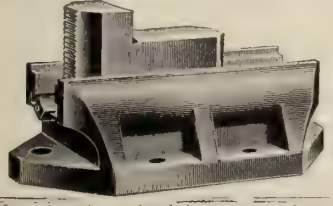
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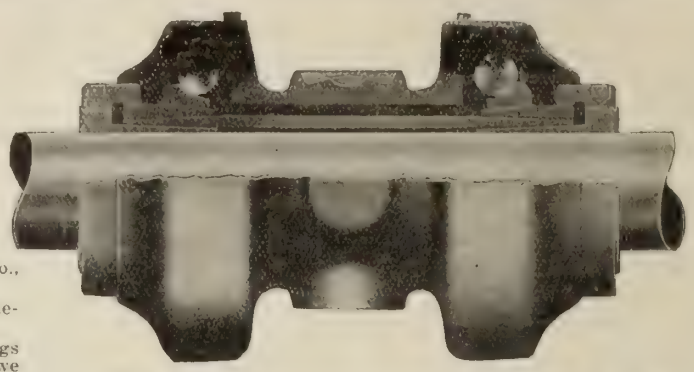
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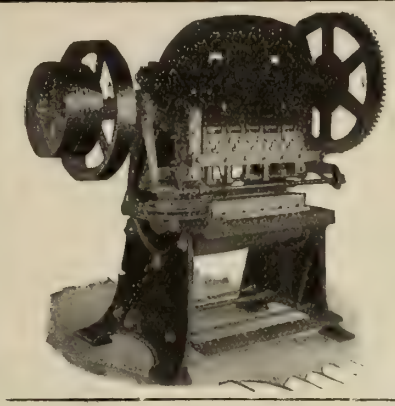
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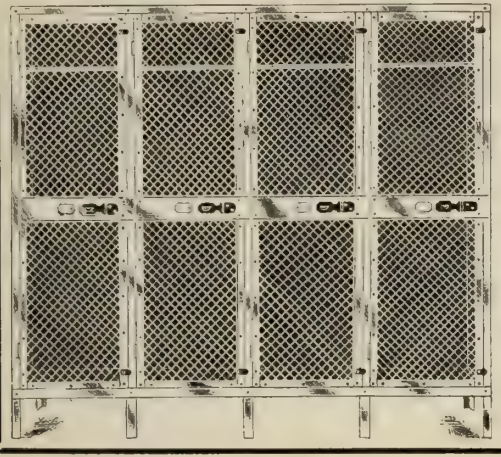
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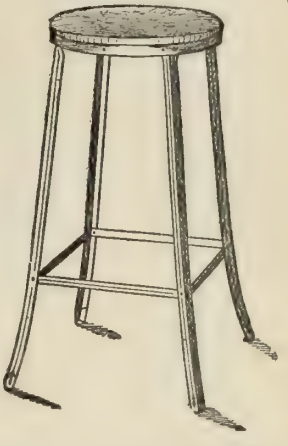


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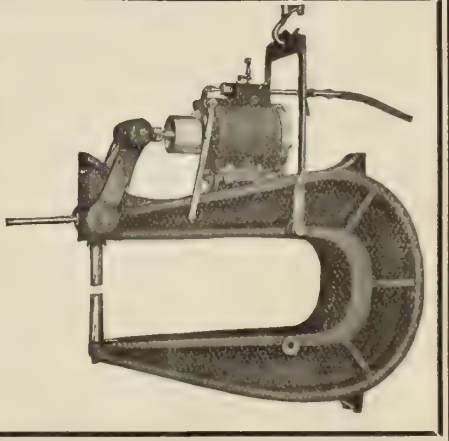
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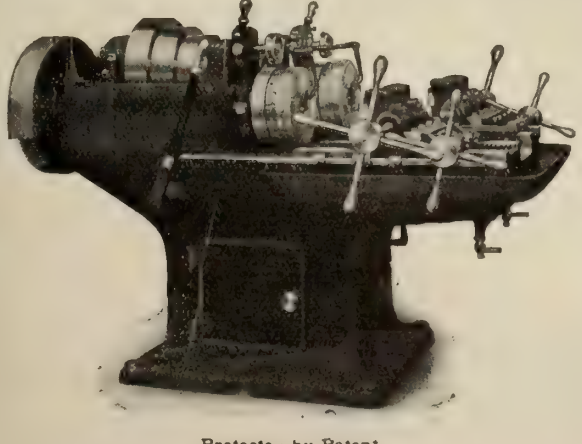
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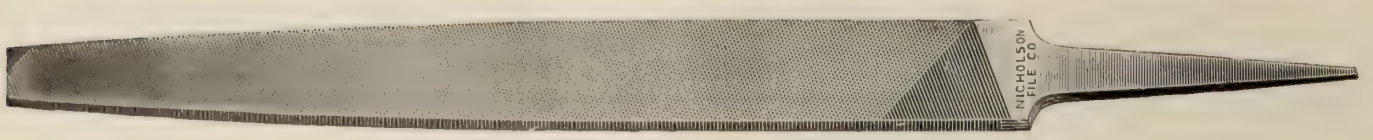
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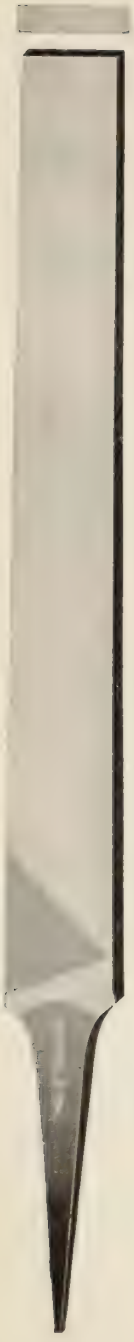
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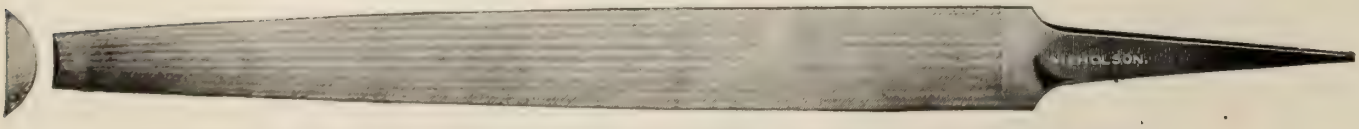
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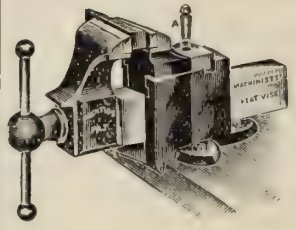
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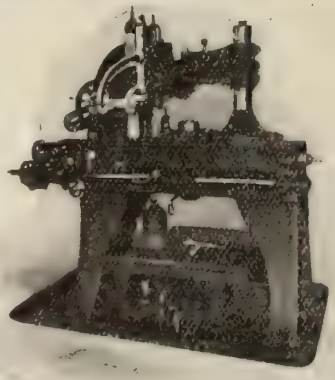


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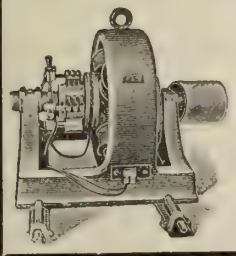
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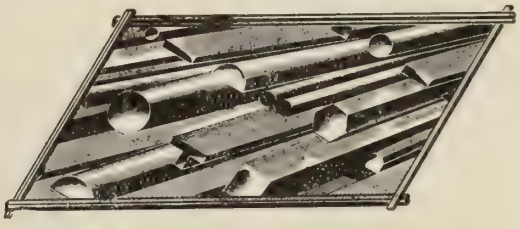
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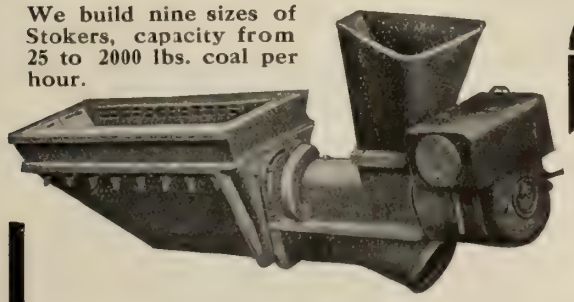
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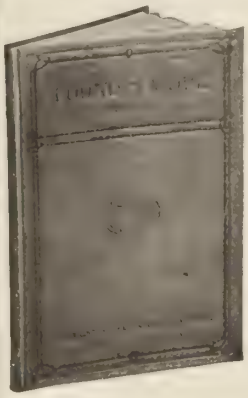
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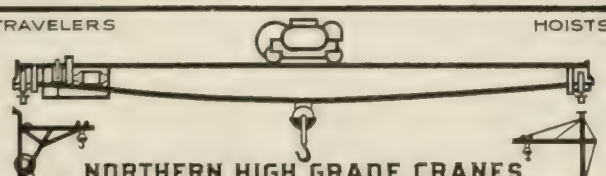
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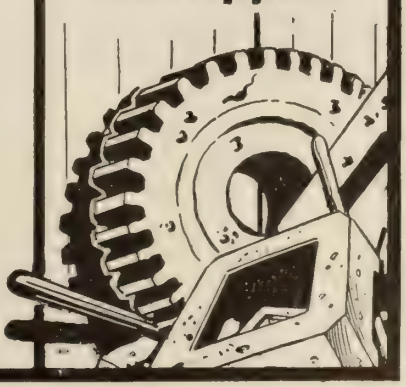
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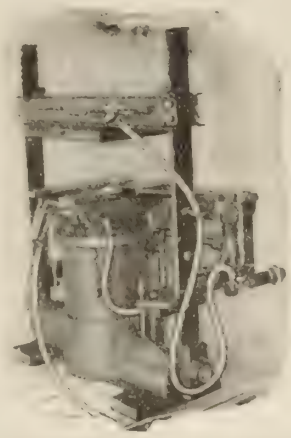
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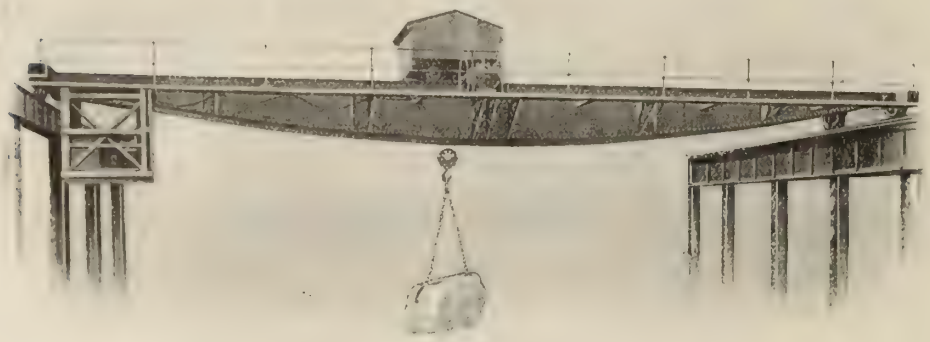


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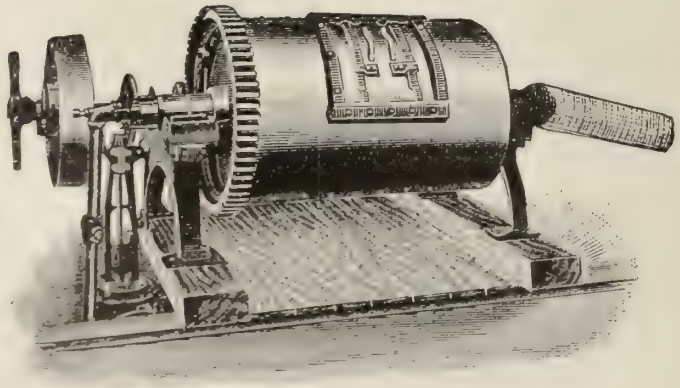


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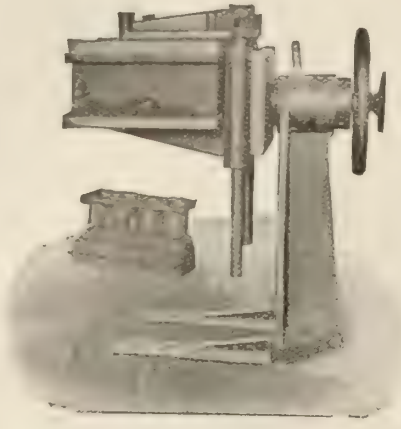
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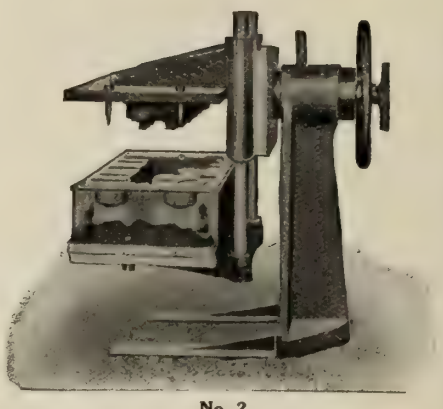
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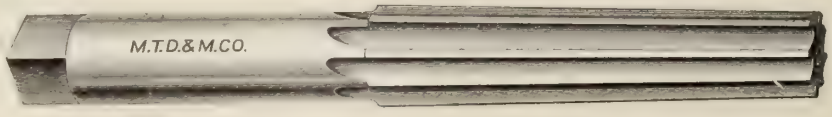
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Tallman Brass & Metal Co., Hamilton

Die Linkers.

Garvin Machine Co., New York

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Garvin Machine Co., New York

Drilling Machinery.

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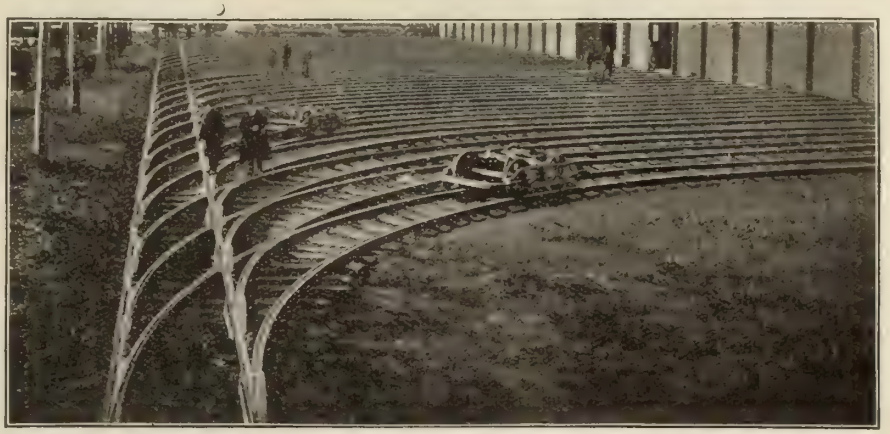
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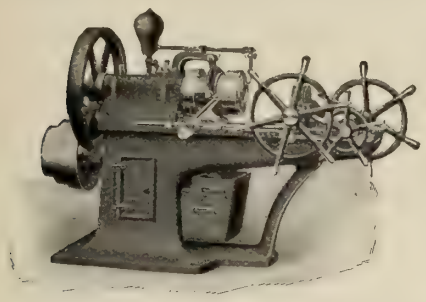
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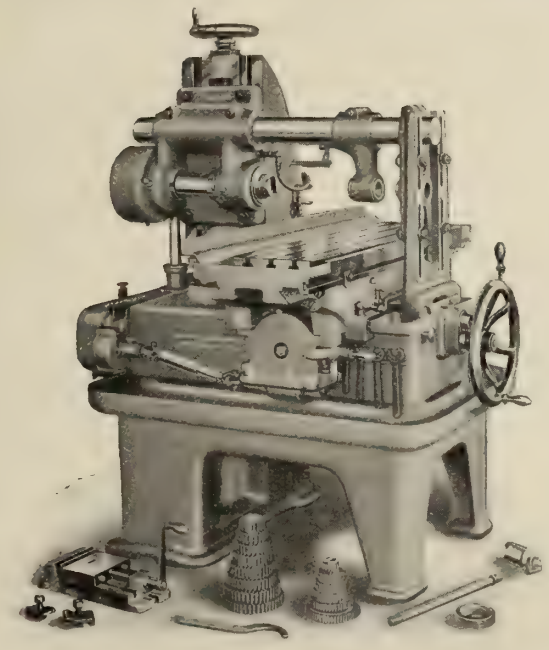
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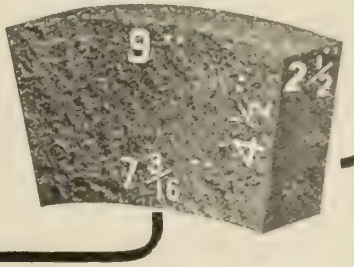
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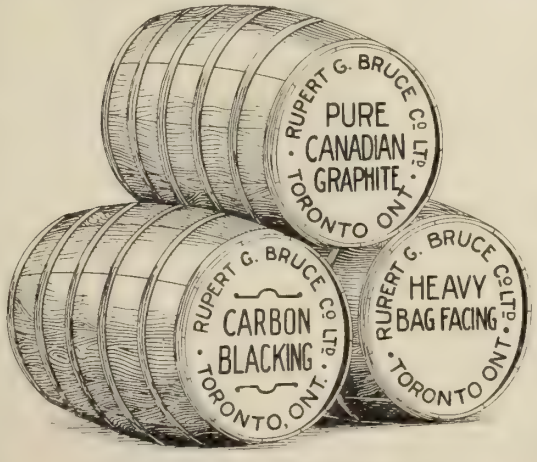
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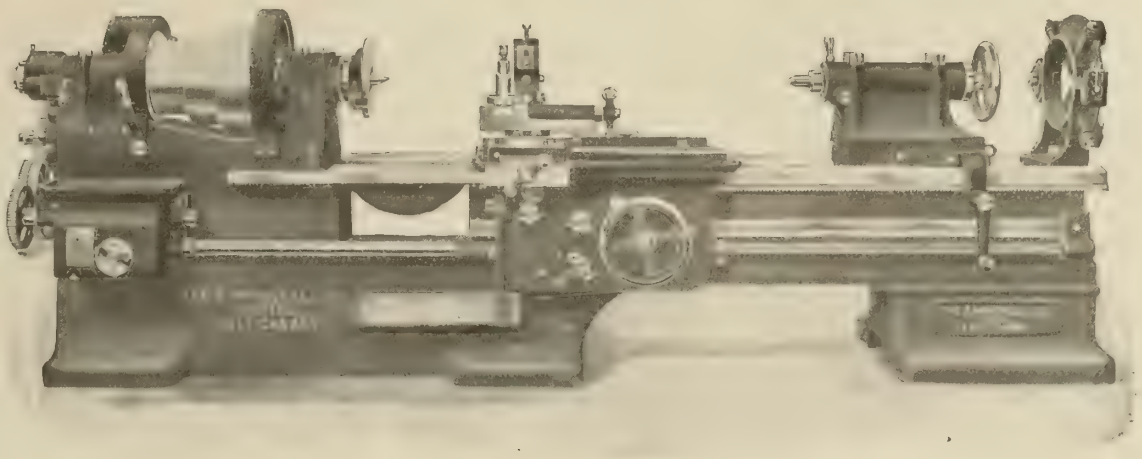
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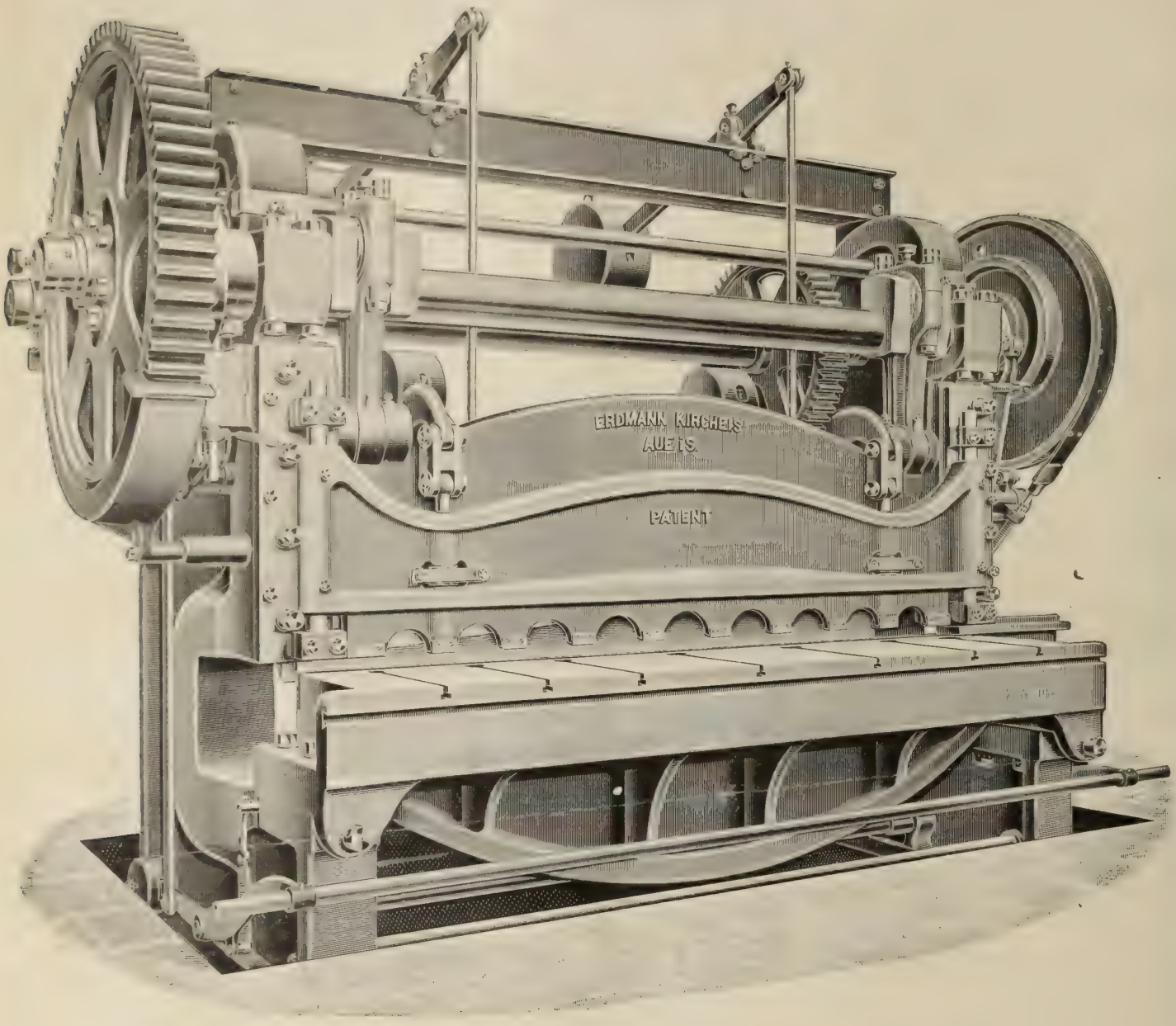
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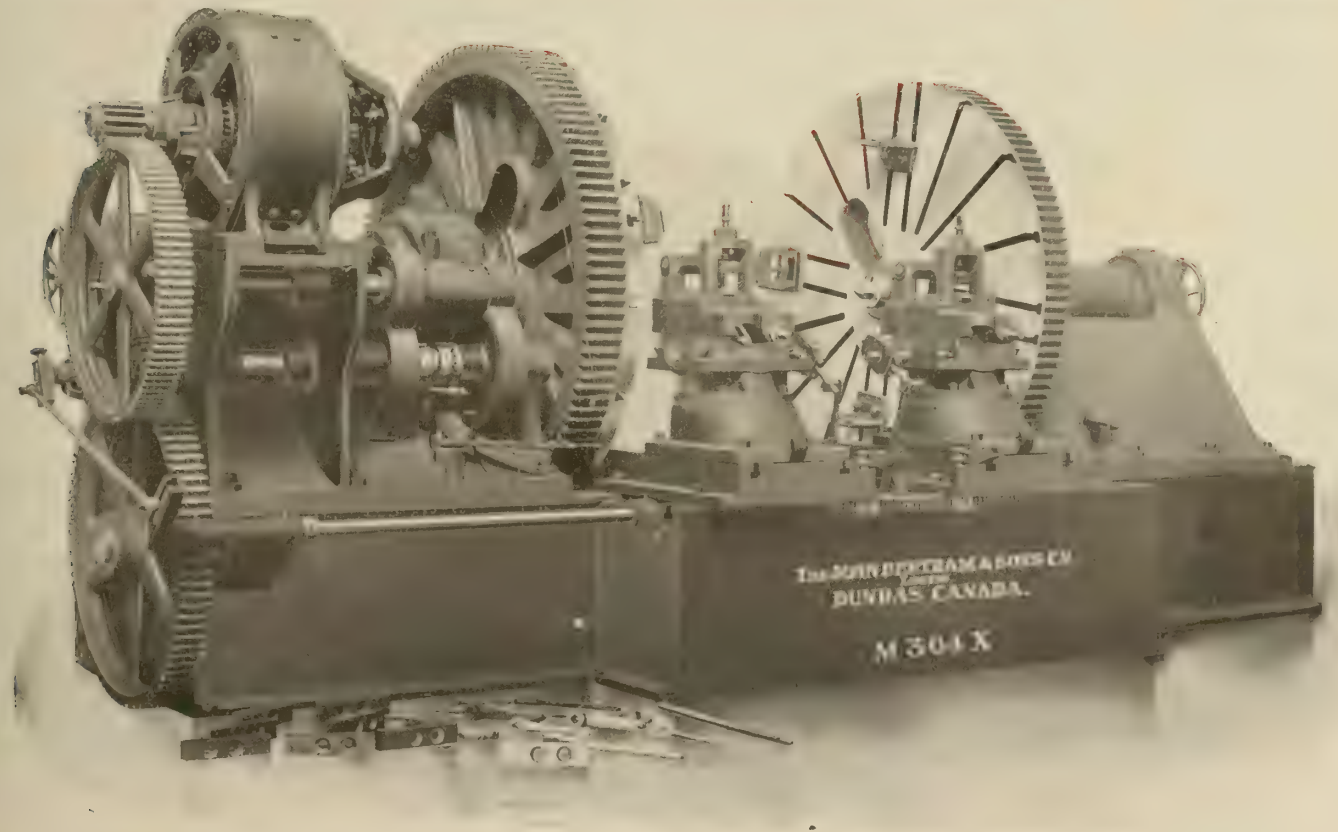
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The John Bertram & Sons Co., Limited

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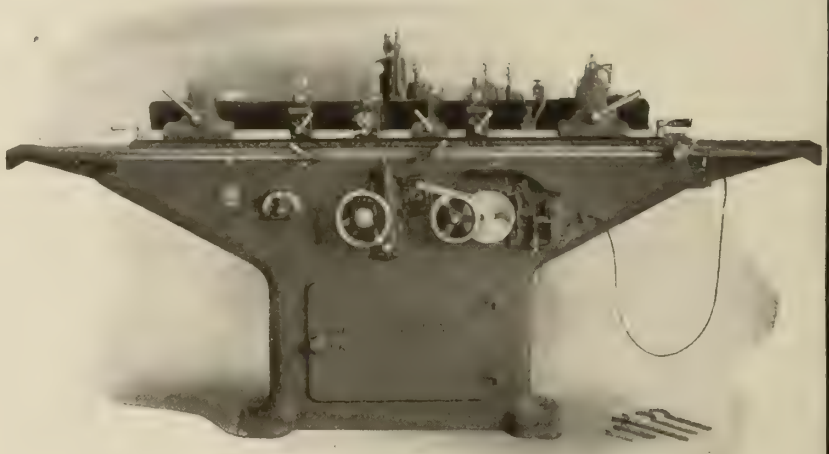
Agents:—The Canadian Fairbanks Co., Ltd. Offices:—Montreal, Toronto, Winnipeg, Vancouver, Saskatoon, Calgary, St. John.

A PERFECT CYLINDER
GROUND AUTOMATICALLY

and exactly to size without any further attention than to place work in position, set sizing device to any desired size and throw in power.

Work is first roughed down with coarse feed which automatically changes to a very fine feed to remove the last thousandth and produce the mirror finish.

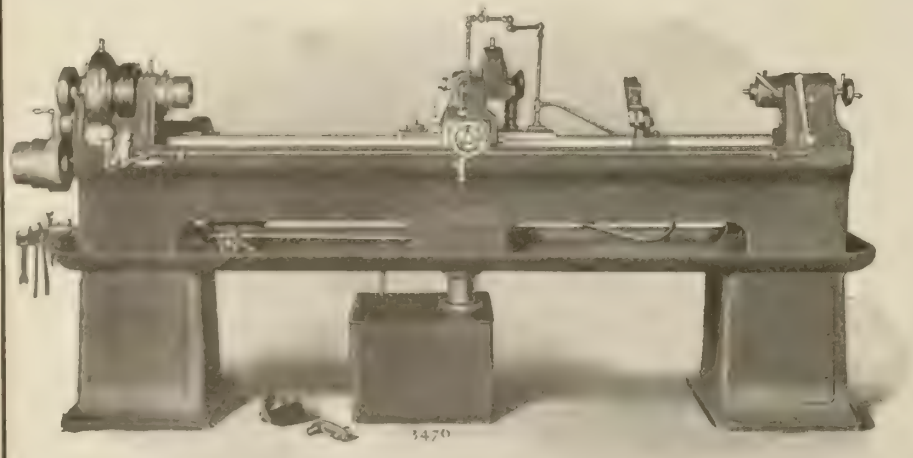
FEED AUTOMATICALLY
STOPS AFTER GRINDING
TO EXACT SIZE



The P. & W. Automatic Sizing Grinder

WRITE FOR CATALOG "GRINDING MACHINES"

FROM A SMALL PRECISION SCREW TO A LARGE ELEVATOR WORM



66 x 8 in. P. & W. Thread Milling Machine. Especially for cutting Lead Screws.

There is no thread cutting operation, single or multiple, or hardly a gear cutting operation that a

P. & W. Thread Miller

cannot do, and do faster, with greater accuracy, better finish and at a lower cost than any other thread cutting machine on the market. Built in six sizes.

IT WILL BE WORTH YOUR TIME TO WRITE FOR CATALOG "THREAD MILLERS."

Pratt & Whitney Co.

HARTFORD, CONN., U. S. A.

Sales Agents---The Canadian Fairbanks Co., Limited

Montreal, St. John Toronto Winnipeg Calgary Vancouver

The advertiser would like to know where you saw his advertisement—tell him.

THE

"B and C"

Combination Wrench

is a most useful tool which should find a place in every mechanic's kit!

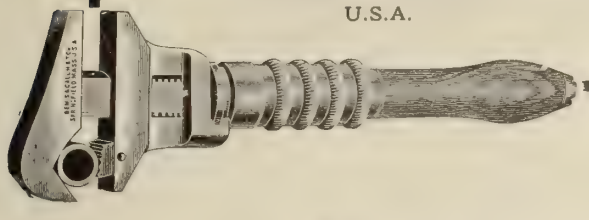
It does the work of two ordinary wrenches, and will be found equally handy for nut or pipe work.

Made of the very finest materials, head, bar and shank being a one-piece steel forging.

Send for complete Catalogue of Wrenches.

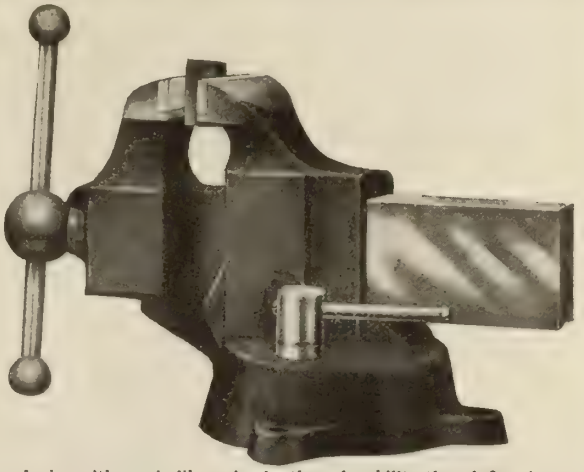
BEMIS & CALL HARDWARE AND TOOL COMPANY

SPRINGFIELD, MASS., U.S.A.



The YOST

Solid Jaw and Swivel Bottom Machinist's Vise



A vise with a grip like grim death; a durability that defies time and the hardest usage.

A vise that will give you a lifetime of perfect service and satisfaction. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

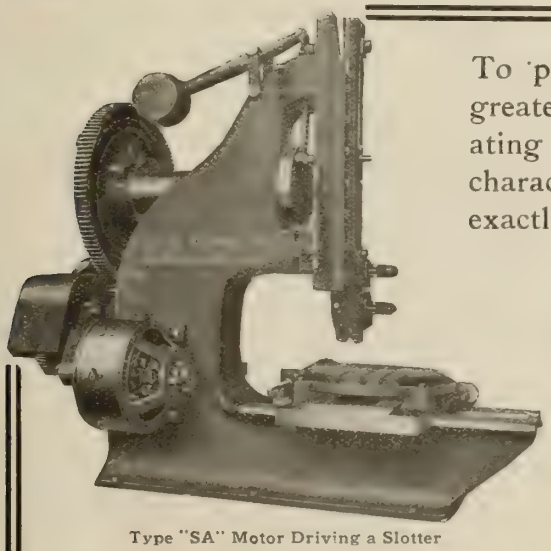
Incomparably Good

The Yost catalog would certainly interest you. Write us, asking for a copy.

CANADIAN YEATES GORDON CO.

HAMILTON - - ONTARIO

This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.



Type "SA" Motor Driving a Slotter

To properly drive machine tools so as to develop their greatest producing capacity, together with the greatest operating economy, it is necessary to thoroughly study the characteristics of each tool, and to apply a motor exactly suited to its operation.

Westinghouse Types 'S' *and* 'SA' Direct Current Motors

are designed and built especially for this kind of work.

Type 'S' Motors are adapted for constant-speed service and for adjustable-speed service within moderate ratios, 1 to 1½ and 1 to 2. Type 'SA' Motors have auxiliary commutating poles, and are adapted for speed ratios of 1 to 3 and 1 to 4. Circular 1068 gives full particulars concerning both types.



Type 'S' Motor ge Straightening Machine.

Canadian Westinghouse Co.

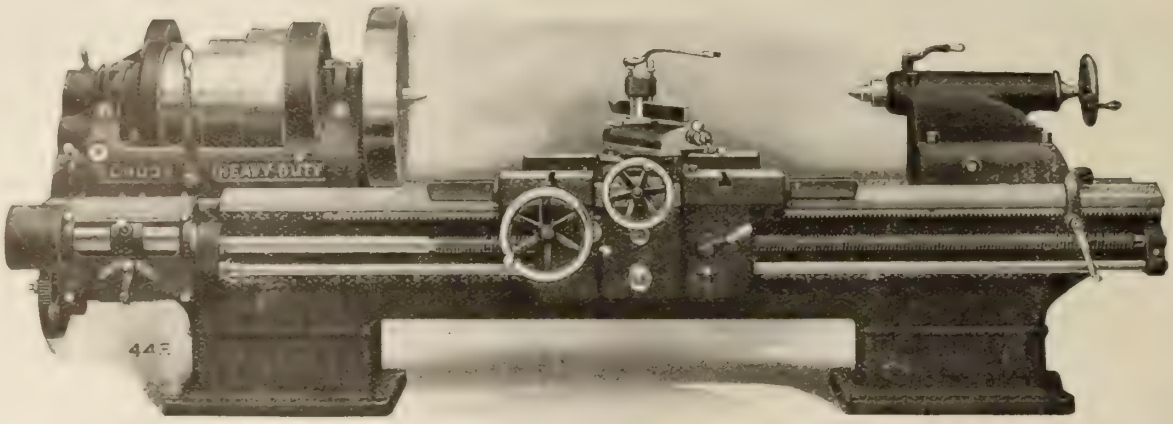
Limited

General Office and Works, HAMILTON, ONT.

For Particulars Address Nearest Office

TORONTO	MONTREAL	HALIFAX	WINNIPEG	CALGARY	VANCOUVER
Traders Bank Building	52 Victoria Square	Telephone Bldg.	158 Portage Avenue E.	311 8th Avenue West	439 Pender Street

Important Announcement



By special arrangement with the R. K. Le Blond Machine Tool Co., of Cincinnati, we are now enabled to offer for the first time in Canadian Machine Tool History, Lathes made in Canada from designs based on the wealth of experience afforded by the United States market, the greatest machine tool market in the world.

By this arrangement we have obtained not alone the designs, but also the jigs and other fixtures which make for accuracy, interchangeability, and produce unequalled workmanship at a minimum of cost.

The above Lathes represent the very last word in Lathe Construction. Powerful, yet accurate and easily handled—designed for getting the greatest amount of work with a minimum of expenditure of energy on the part of the operator.

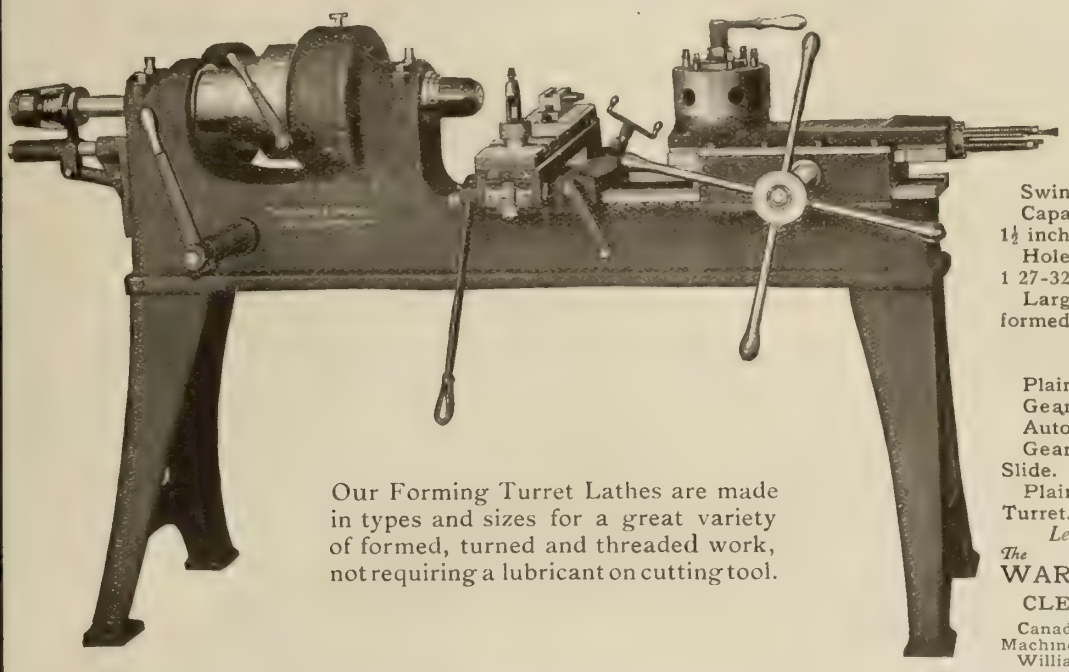
Details of construction will appear from time to time in our advertisements.

London Machine Tool Co., Limited

HAMILTON, CANADA

Eastern Agents: Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que.

FORMING TURRET LATHES



Our Forming Turret Lathes are made in types and sizes for a great variety of formed, turned and threaded work, not requiring a lubricant on cutting tool.

For Brass Work

SIZES

Swing—14, 16, 18, 20 inch.
Capacity—Auto. Chuck 1, 1⅛, 1¼ inch.
Hole in Spindle — 1¼, 1 7-16, 1 27-32 inch.
Largest Diameter that can be formed—2, 3, 4, 5 inch.

TYPES

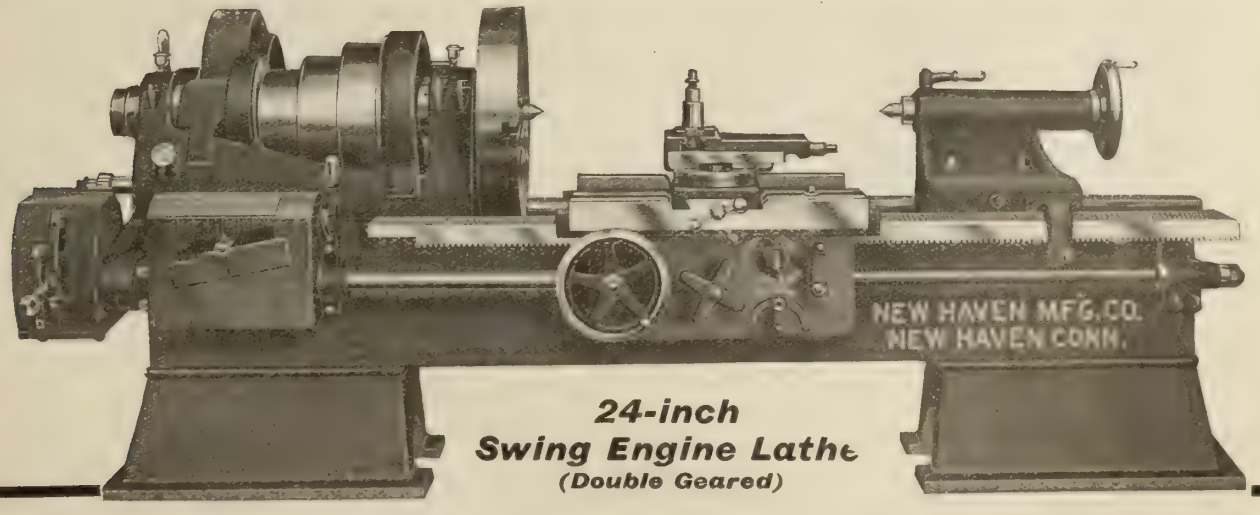
Plain Head.
Geared Friction Head.
Automatic Chuck.
Geared Power Feed for Turret Slide.
Plain Turret Slide or Set-over Turret.

Let us send you full details.

The
WARNER & SWASEY CO.
CLEVELAND, OHIO, U.S.A.

Canadian Agents --- A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Montreal

Our Forming Turret Lathes have a wide range for the rapid production in brass of Valve Bonnets, Oil Cups, Handles, Lubricator, Injector and Ejector parts, in fact any forming, turning or threaded work coming within the capacity of the machines.



24-inch Swing Engine Lathe (Double Geared)

The conspicuous features of the

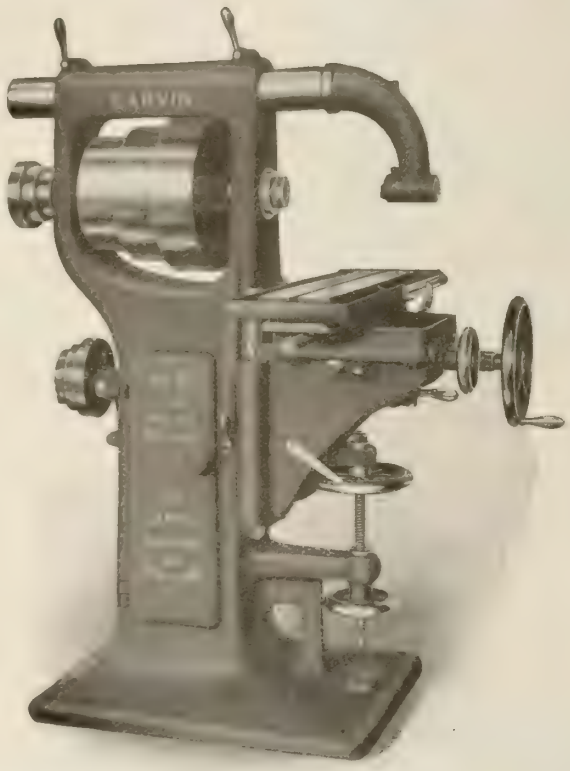
NEW HAVEN LATHE

that have made it the favorite machine in so many engineering shops are its ACCURACY, DURABILITY and RELIABILITY. Purchasers of NEW HAVEN LATHES have our unconditional guarantee back of every Machine, and may rely on them absolutely.

Write us to-day for detailed specifications and prices.

New Haven Manufacturing Company, New Haven, Conn., U.S.A.

GARVIN No. 21
Plain Milling Machines
PLAIN OR BACK-GEARED



No. 21 PLAIN MILLING MACHINE

Universally used by Large Manufacturers in Batteries of SIX TO ONE OPERATOR, enabling them to produce a large amount of milling at the least possible cost.

The machines are well built, sold at a moderate price and will take care of a great quantity of plain or gang milling for general manufacturing. They have a No. 10 B & S taper hole in spindle with draw-in-rod for arbor and are driven by a large wide face cone pulley. The table has a large oil pan all around. It is provided with screw feed, automatic trip and quick return by a large hand wheel which affords an easy, rapid movement. Adjustments 18 x 6 x 13 in.

FOR FURTHER INFORMATION ASK YOUR DEALER OR WRITE US DIRECT

IMMEDIATE DELIVERY

Send for Circular No. 153

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

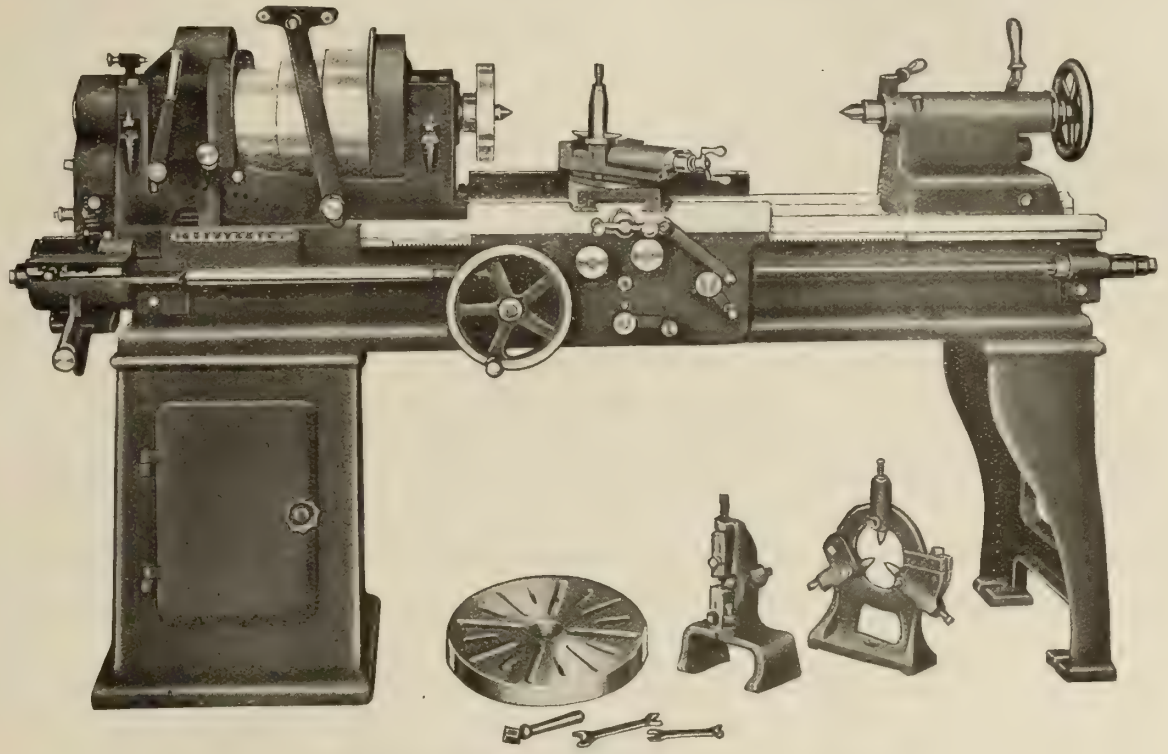
MANUFACTURERS OF

Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.

OUR

Machine Tools

ARE DESIGNED AND BUILT TO MEET THE MOST ADVANCED IDEAS



ENGINE LATHE WITH QUICK-CHANGE GEARS.

This machine has been designed for manufacturers who wish to get all the advantages of the newer types of high speed steel and to have a machine thoroughly modern in every respect and capable of turning out the best quality of work continuously and economically.

Full specifications furnished on application.

WE ALSO BUILD

Engine Lathes, Break Lathes, Pit Lathes, Face Lathes, Shapers, Planers, Drop Hammers, Helve Hammers, Drilling Machines, Punch and Shears, Power Presses, Slotting Machines

Canada Machinery Corporation, Limited

GALT, ONTARIO

Selling Agents:

VANCOUVER—A. R. Williams Machinery Co., Limited
TORONTO—A. R. Williams Machinery Co , Limited
WINNIPEG—A R Williams Machinery Co., Limited
ST. JOHN, N.B.—A R. Williams Machinery Co., Limited
MONTREAL—Williams & Wilson

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

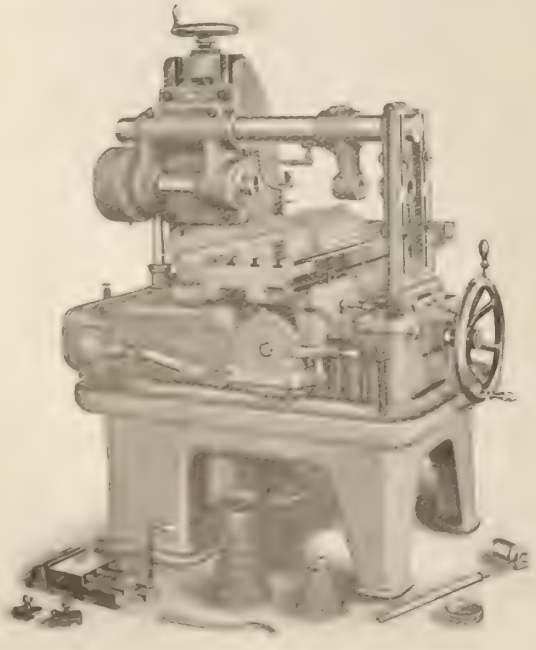
Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

Every Up-to-date Machine Shop should have a



"MODERN" Universal Grinder

Its many points of superiority over ordinary universal grinders are fully described in our illustrated catalog, a copy of which will be mailed to you

Free on request.

We would also be glad to place our experience at your disposal.

This machine is more rigid and durable, and is better made than most grinders, and it produces more work and better work than any similar machine made.

Among the many improvements incorporated in the Modern Universal Grinder is our new patented table hand wheel stop, which *stops hand wheel while table is in motion*, thereby eliminating the shock from the quick reverse of the hand wheel.

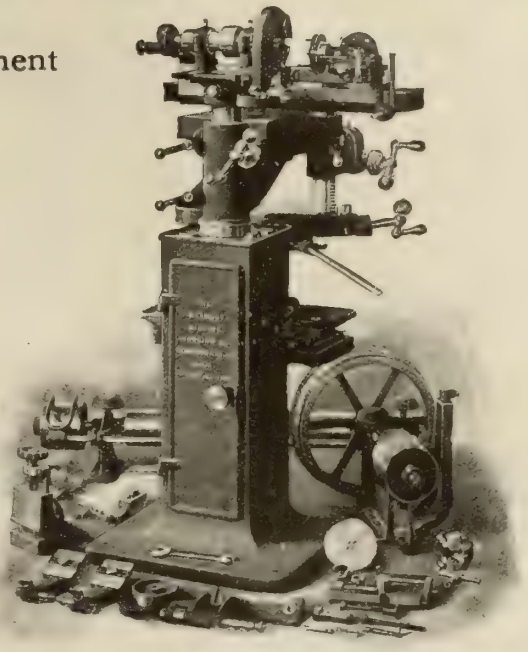
Made in two sizes—Sold at interesting prices. It will be worth your while to write us before buying.

MODERN TOOL CO., ERIE, PA., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

Cincinnati Cutter Grinder Improvements

Taper Gib for Adjusting Slide
More Substantial Stop Dogs With Fine Adjustment
Stiffer Knee



A FEW IMPORTANT FEATURES:

KNEE SWINGS ABOUT COLUMN TO ANY ANGLE
and table swivels about fixed centre on slide, bringing work into any desired position in relation to emery wheels.

GRADUATED DIALS
on all swivels and adjustments.

A QUICK LEVER FEED
for sharpening cutters and also a slow screw feed for other work. Use cup-shaped wheel for sharpening cutters.

HAS MICROMETER ELEVATING DEVICE
for setting cutters or reamers for desired clearance—and on this depends the successful working of these tools.

SOME THINGS IT WILL DO
It will sharpen all manner and shapes of cutters, reamers, etc. Will do internal cylindrical, surface, angular and face grinding.

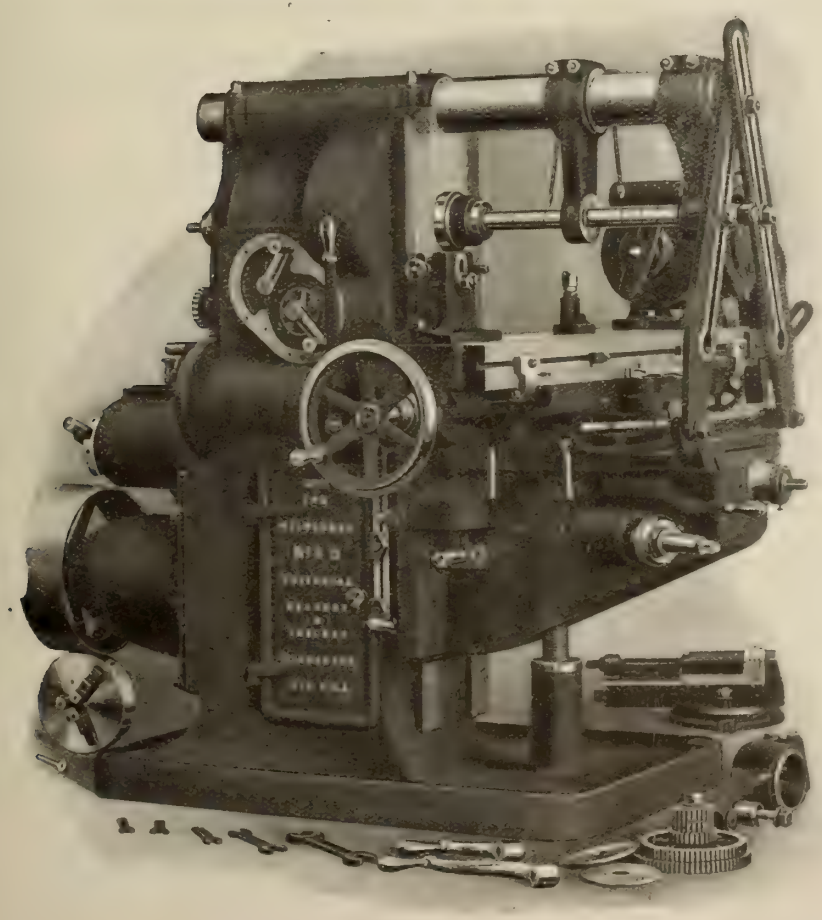
IT WILL SAVE YOU MONEY
because it will sharpen cutters, reamers, etc., correctly, and quicker than any other similar tool. It is simple and convenient to operate. Any boy can run it.

Ask for Treatise Giving Details of Machine and its Operation.

The Cincinnati Milling Machine Company

CINCINNATI, OHIO, U.S.A.

Canadian Agent—H. W. PETRIE, Ltd., Toronto, Montreal and Vancouver.



THE MILWAUKEE

No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

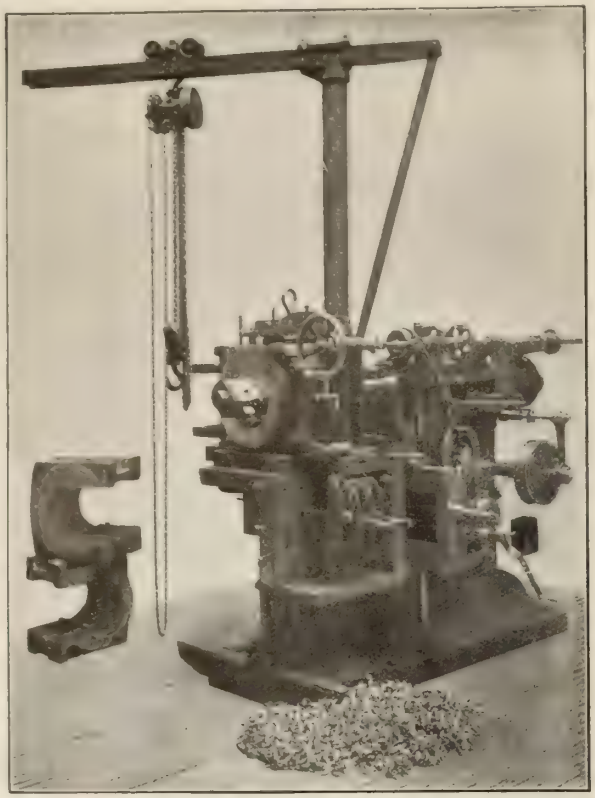
Let us send you more particulars.

Kearney & Trecker Co.

Manufacturers - Milwaukee, Wis.

Agents:
The A. R. Williams Mach'y Co., Toronto
Williams & Wilson - Montreal

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

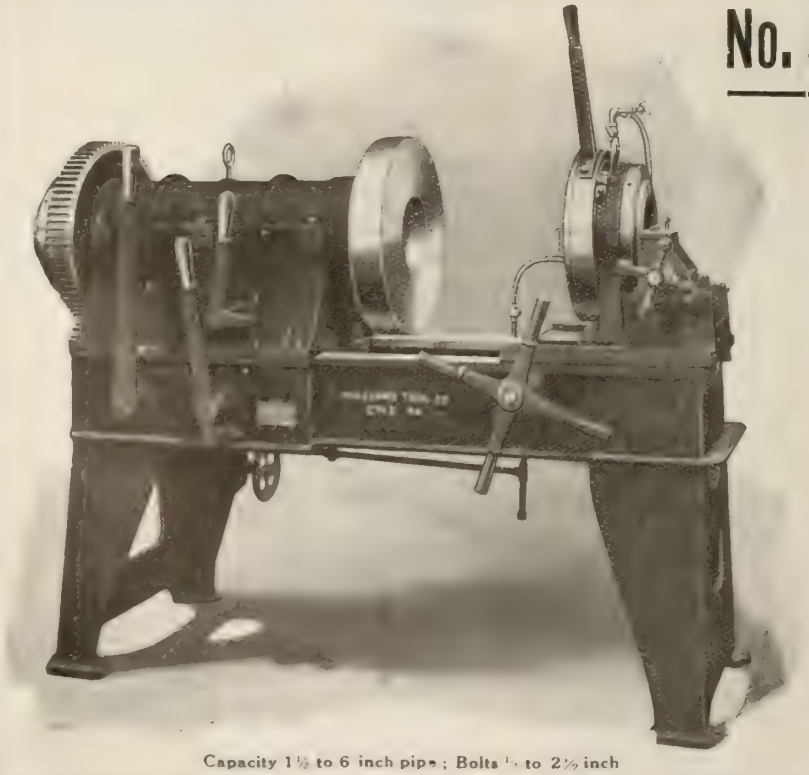
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1½ to 6 inch pipe; Bolts ⅝ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼″ to 2″; ½″ to 3″; 1″ to 4″; 1½″ to 6″; 2″ to 8″ and 3½″ to 12″.

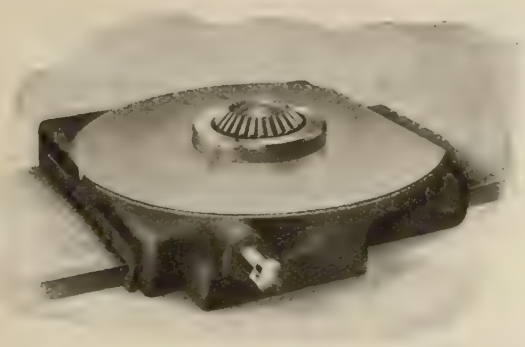
Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

Send for Description and Prices.

WILLIAMS TOOL CO.

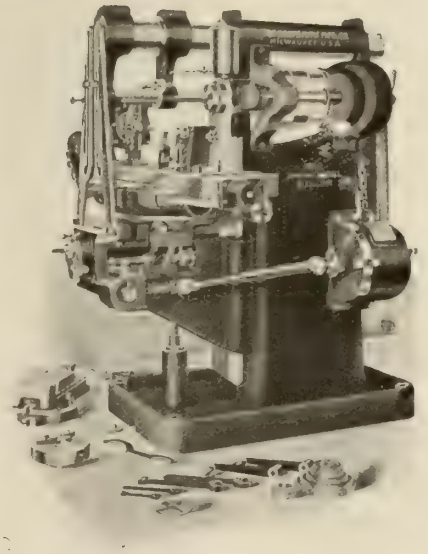
Box 18 Erie, Pa., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.



Broad, Continuous Bearing Surfaces give the

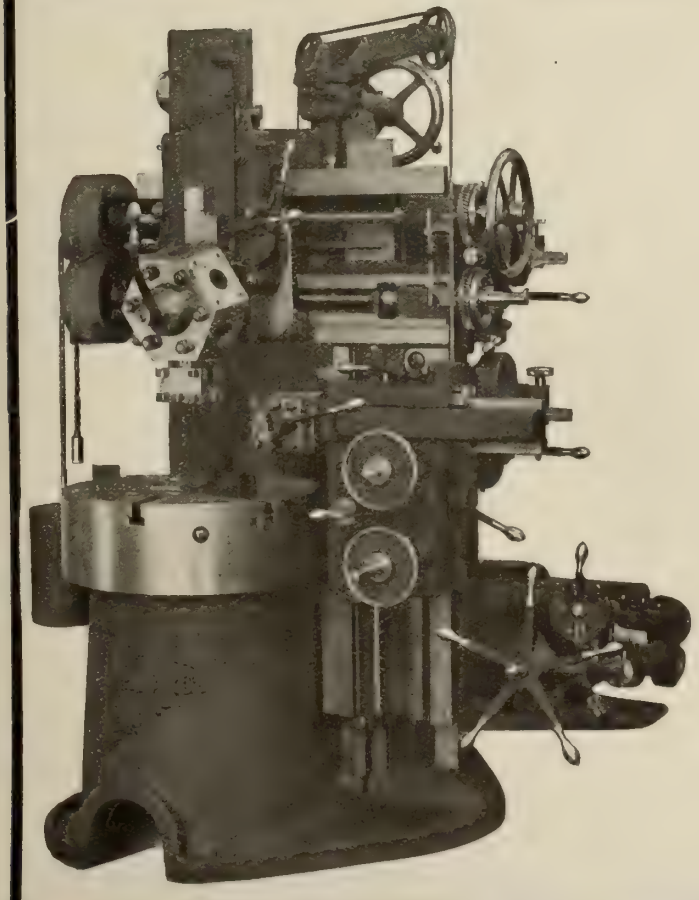
KEMPSMITH UNIVERSAL MILLER



that strength and rigidity which make it good for the same heavy work as the similar size plain MILLER. See the full uninterrupted sweep of bearing of the universal swiveling block on the saddle, clamped rigidly to any position by ONE screw, conveniently located. Where a machine is to be used in a general line of work this point is a vital one.

The KEMPSMITH MFG. COMPANY, Milwaukee, Wis.

Canadian Agents: Rudel-Yeates Machinery Co., Montreal



THE MODERN DESCENDANT OF TWO GOOD MACHINES

The Vertical Turret Lathe is the latest machine for *multiplied* saving and output.

It combines the good features of the **Horizontal Turret Lathe** and the **Vertical Boring Mill.**

By vertical construction, chucking is made easy, and with both a main and a side head, the holding in instant readiness of a complete setting of tools is possible.

Write for new treatise on Face Plate Work No. C15.

It's free it shows how to "cut costs by cutting time between cuts."

The
Bullard Machine Tool Co.
Bridgeport, Conn., U.S.A.

"Hard Service" Electrically Operated Drills and Reamers



Type "D."

Economical

Efficient

Dependable

Built in 6 sizes. Scope 0-2 inches.

Your ultimate portable tools, if you want the GREATEST OUTPUT in THE LEAST TIME at the LOWEST COST. Others are doing it, why not you?

Write for Bulletin No. 20.

Canadian Agent:

R. E. T. PRINGLE, Eastern Townships Bank Building MONTREAL - CANADA

SOME of Our Specialties

PNEUMATIC AND ELECTRIC TOOLS—"New Boyer" Riveters and Chippers, "Little Giant" Pneumatic Drills, Duntley Air Cooled Portable Electric Drills, Grinders, etc., manufactured by the Chicago Pneumatic Tool Company.
AIR COMPRESSORS—"Franklin" Type, all styles and sizes.
ANTI-RAIL CREEPERS—All types, absolutely prevent rails creeping.
BUMPING POSTS—The "Gibraltar" Structural Steel.
RAIL BENDERS—Q. & C. "Samson."
LOCOMOTIVE AND CAR REPLACERS—"Fewings" Cast Steel.
COUPLER KNUCKLES— "Gilman Brown" Emergency.
JOURNAL BOXES—"McCord" Malleable Iron.
PRIEST SNOW FLANGERS—Bring your trains in **"On time."**
"AJAX" CAR VESTIBULE DIAPHRAGMS—Canvas, with steel reinforcement.
PANTASOTE CURTAIN MATERIALS—Any style, latest design.
FREIGHT CAR DOOR FIXTURES Security Side and End Door. Dunham Side end End Door.
STEEL BACK BRAKE SHOES—Locomotive, tender, passenger and freight car equipment.
MONKBRIDGE STAYBOLT IRON—Best Yorkshire, stands all tests.
McKIM GASKETS—Copper covered, asbestos and rubber filled.
GRAY'S CHIMNEYLESS LONGTIME BURNERS—None equal, ask us for sample.
FORSYTH BUFFING DEVICE—The high capacity shock absorbing device.
CONCRETE REINFORCEMENT STEEL—Maxwell "Deformed" Bar.
H. R. RATCHET BRAKE LEVER—For all classes of equipment.

If you would like catalogues or prices, write us, and we will forward same promptly and cheerfully on receipt of your request.

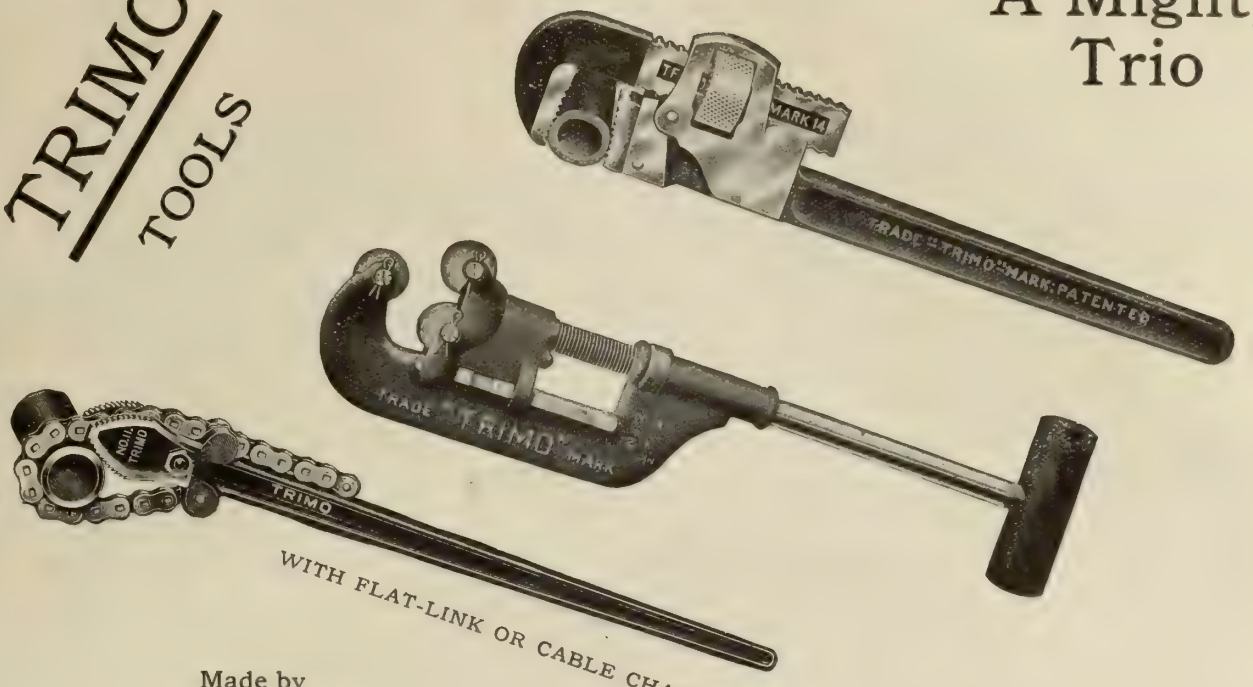
The Holden Company, Limited

42 York Street, TORONTO, Ont. | 354 St. James Street, MONTREAL, Que. | 291½ Portage Ave., WINNIPEG, Man.

The advertiser would like to know where you saw his advertisement—tell him.

TRIMO TOOLS

A Mighty Trio



WITH FLAT-LINK OR CABLE CHAIN

Made by

Trimont Mfg. Co.

Roxbury, Mass.

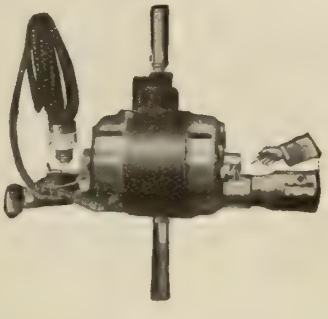
Send for Catalog No. 200

U. S. Electric Drills and Grinders

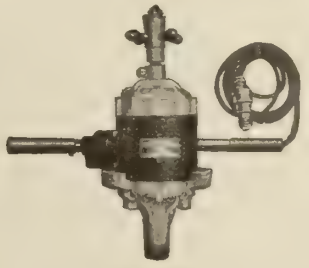
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



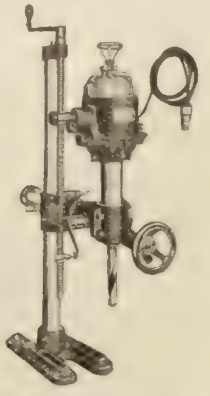
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FARIBANKS CO., LTD.

Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - - OHIO, U.S.A.

A Splendid Tool for the Pattern Shop

Over 1,000 now in use—two-thirds of them were sold to Pattern Shops



No 254 Bench Hand Planer.

This machine is designed especially for the Pattern Shop. It accomplishes perfectly any work to which it may be applied in the Pattern Shop, such as Plane, surface. straight or tapering, joint, edge, etc.

Our No. 254 Bench Hand Planer

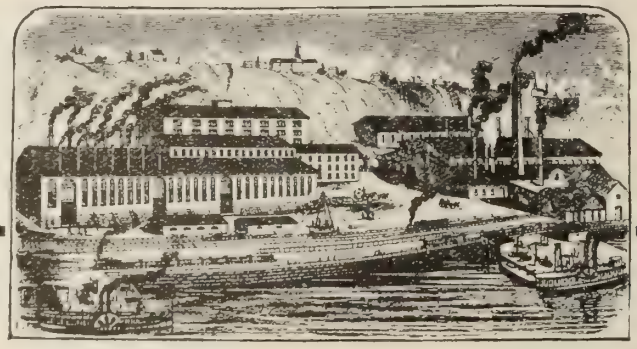
is not expensive — the price is within the reach of all—the Pattern Maker cannot afford to be without it.

WRITE FOR LARGE ILLUSTRATED CIRCULAR

J. A. Fay & Egan Co.

362-382 West Front Street
CINCINNATI, OHIO

MARINE ENGINES and PUMPS. SHOE MACHINERY A Specialty



BRASS and IRON CASTINGS. BOILERS and REPAIRS.

That we have exceptional facilities at our disposal for the manufacture of all kinds of Machinery —in addition to our business as Brass and Iron Founders, General Contractors and Shoe Machinery Engineers—has been amply proved this year. In the short space of five months, we built and installed all the Engines and Boilers of the new sister steamers "Levis" and "Lauzon," whose trial trips were a complete success. We make a specialty of all kinds of Marine Engine Work, and shall be glad to quote for first-rate products only.

SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

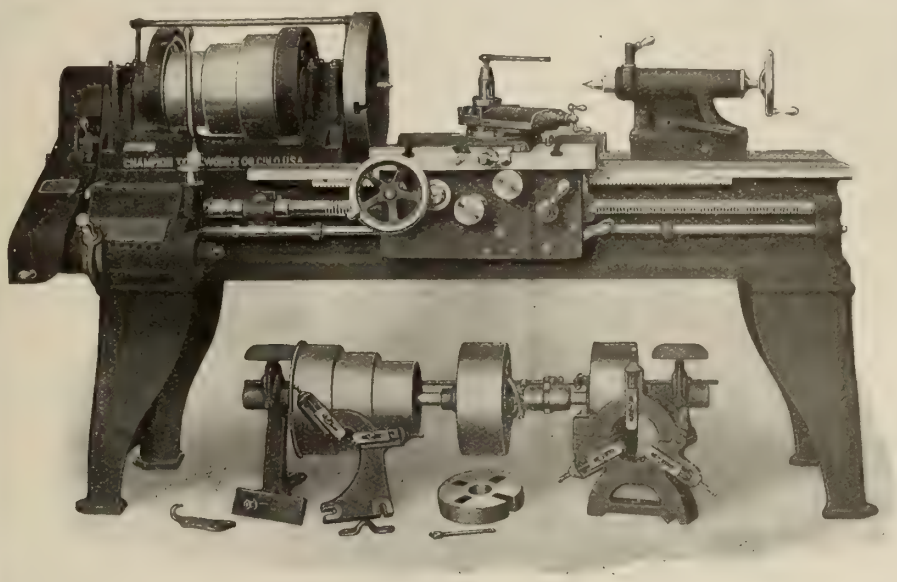
Wire of every description for Slugger and Standard Screw Machines.

The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director

LEVIS, Quebec

First Aid to the Superintendent are these



16" Quick Change and Double Back Gear Lathe

CHAMPION LATHES

If you have standing in his way equipment not up-to-date, you can't expect a big output of high-class work, can you?

When you do buy, give him the best, and the more so especially if you can purchase such tools at no greater cost than what should be paid for a first-grade article.

Write for Our Catalogue of 10-12-14-16 and 18-inch Lathes.

And make a few of your own comparisons of the capacities and conveniences to be found in these tools, the accuracy of which can hardly be questioned.

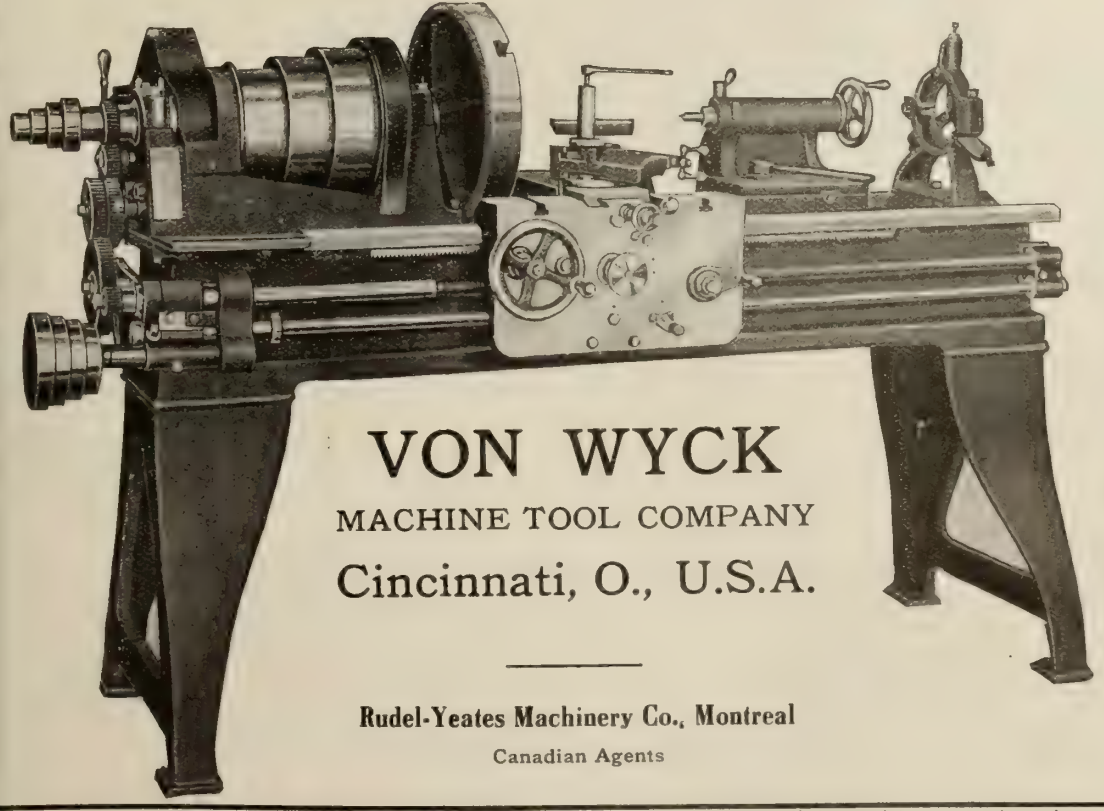
Quick Change or New Standard, with or without Double Back Gear, Taper or other Attachments.

CHAMPION TOOL WORKS COMPANY

Station B CINCINNATI, OHIO, U.S.A.

A High-Grade Small Engine Lathe at Moderate Cost!

You can use one in YOUR shop.



VON WYCK

MACHINE TOOL COMPANY

Cincinnati, O., U.S.A.

Rudel-Yeates Machinery Co., Montreal

Canadian Agents

The only reason why we can sell you a machine so good as this at the moderate price we quote is because we make them in large lots by the most approved methods known.

WRITE our Canadian Agents for Descriptive Circular and **PRICE**

DIE BLOCKS

CRUCIBLE OR OPEN
HEARTH STEEL

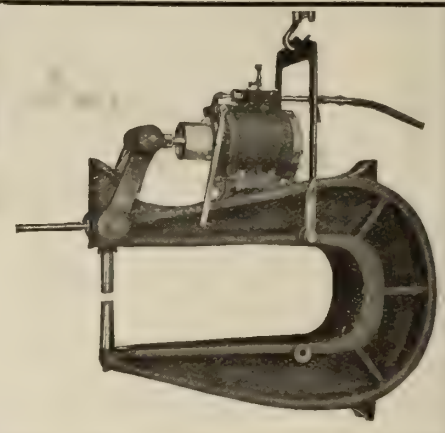
Canada Forge Co., Limited, : Welland, Ontario

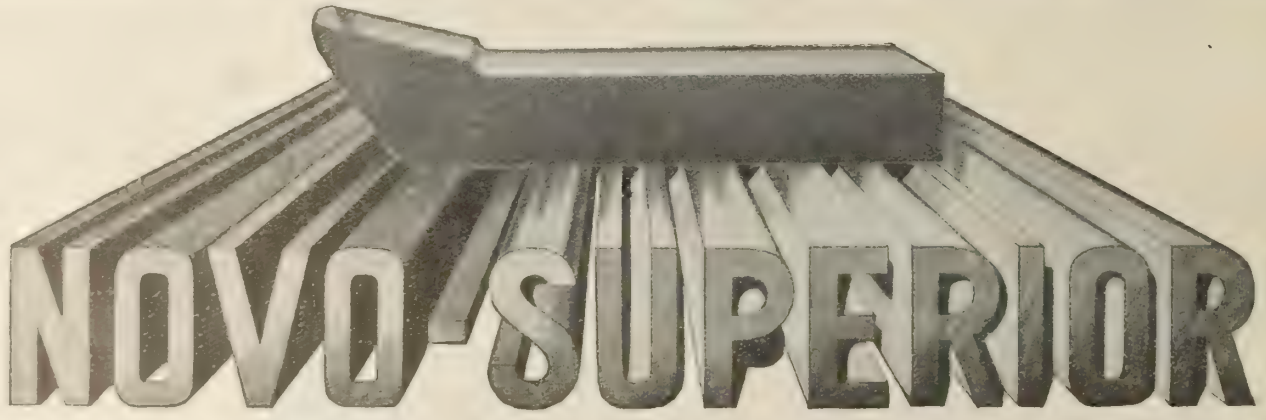
Buy an ALLEN PORTABLE PNEUMATIC RIVETER and be sure of the fastest and tightest riveting at the lowest cost

Send for our unequalled "Records." They will interest you.
Special riveters designed to meet all requirements.

"WHATEVER THE RIVETING, THERE'S AN ALLEN FOR THE JOB."

JOHN F. ALLEN COMPANY
Est. 1872
370-372 Gerard Avenue, NEW YORK
AGENTS—Canadian Rand Drill Co., Toronto, Halifax, Montreal. Liebers and W.U. Codes, "Riveter."





High Speed Steel Has a Solid Foundation In a Name That Means Something

Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND CONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL



Edgar Allen & Co., Limited

Manufacturers of

TRAMWAY POINTS and CROSSINGS

Tramway Passing Places, Junctions, Depot Sidings, Lay Outs

Supplied complete with all Fittings ready for laying on the road.

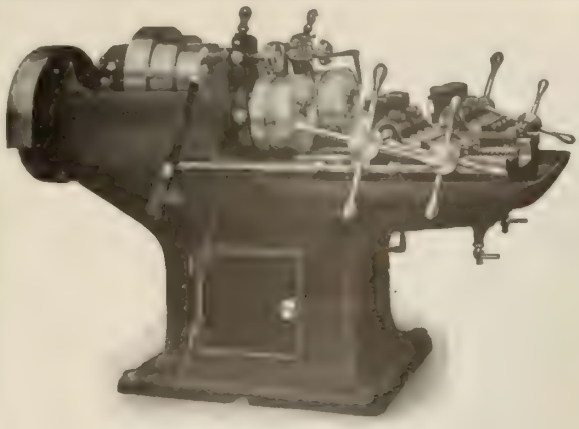
OVER 20 YEARS' EXPERIENCE

Sole makers of

ALLEN'S IMPERIAL MANGANESE STEEL

Manager for Canada--THOMAS HAMPTON

330 ST. JAMES STREET : : MONTREAL



Protected by Patents

HEAP'S

High Speed BOLT and PIPE THREADING Machines are made in all sizes with Single and Multiple Heads.

Our New Patent Die Head is the most simple and the only mechanical Die Head on the market.

The dies are not operated by springs with their attendant troubles.

Before placing your orders enquire closely into our claims.

Send for Catalogues

Joshua Heap & Co., Limited

Ashton-under-Lyne, England

Canadian Agents: PEACOCK BROS., Montreal

Save Time and Power

You need more than lifting capacity in your hoists. The speed of lift and the pull necessary are vital points in shop economy. In both these points no other hoist made equals the

"CYCLONE"

HIGH SPEED CHAIN HOIST

The two-ton "Cyclone", for instance, overhauls only 39½ feet of chain, with a pull of 125 lbs., to raise two tons one foot.

This unequalled efficiency of the "Cyclone" is due chiefly to its unique "internal yoke" gearing and its self-lubricating graphite bronze bushings.

Write for our Catalogue—it describes the "Cyclone" fully.

JOHN MILLEN & SON, LIMITED

MONTREAL TORONTO WINNIPEG VANCOUVER

Address all correspondence to 321 St. James Street, Montreal



"S-T-E-R-L-I-N-G"

HACK-SAW-MACHINES

Have Proved Their Superiority By Actual Test

"Sterling Hack Saw Blades" in a "Sterling Machine" will save you time and money, giving results which cannot be obtained from any other machine.

"Handled by First-class Jobbers."

Manufactured by

Diamond Saw and Stamping Works

Buffalo, N. Y., U. S. A.



The Machine that does it.

Riveting by Lightning

NO RIVETS USED.

You have heard of lightning melting a piece of metal.

That is what's done in a Spot Welder—only the lightning is tamed and harnessed. So tame that you can't feel it (only three to five volts), and harnessed to a machine that a boy or girl can operate with absolute safety. And FAST—well you have heard of "greased" lightning. That's the brand.

One "Spot" will weld two pieces of No. 18 gauge sheet steel together tighter than two rivets. The same machine will weld No. 10 gauge or No. 28 gauge equally as well.

Spot Welded—so called because the small point in the metal the size of a rivet is melted—fused together at the spot where the copper dies touch the metal.

No holes to punch—no rivets to use—no projections to raise—no time wasted.

Our new catalog tells about spot and butt welders, and its yours for the asking.

No Lease. No Royalty. No License.

The "Toledo" Electric Welder Co.

CUMINSVILLE, CINCINNATI, OHIO, U.S.A.

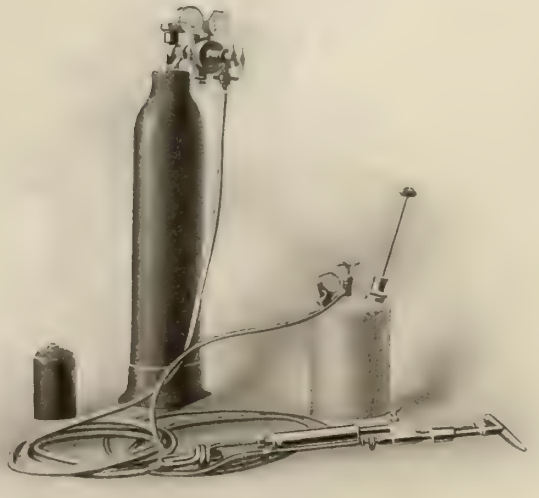
NEW METHOD OF WELDING

Keep Your Scrap Heap Corner Empty

Have your broken castings repaired. Do not lose time **waiting for new castings.** They can be repaired by welding the cracks and broken parts **by the autogenous welding process and made as good as new.**

Blow holes in rough or machined castings of any metal filled up. Holes drilled by mistake filled up. Broken or cracked gasoline engines and automobile cylinders welded. Broken or cracked pulleys, gear wheels, etc., welded. Flanges welded on pipes. Metal added on parts worn out by friction. Teeth renewed on broken gear wheels. Tanks made absolutely water or oil tight. Cutting steel or wrought iron of any thickness and in any position. Cracks and corrosions in boilers a specialty.

Plants supplied for doing the work.
All welding and cutting work undertaken.
Let us send you full particulars.

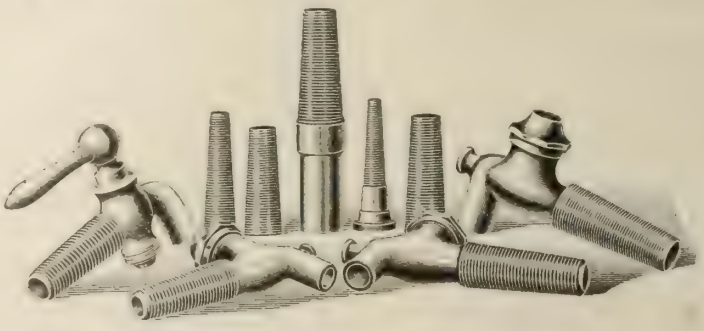


R. J. LEVY, ***Manufacturer of Oxygen and Welding Specialist.***

3 St. Monique Street - - MONTREAL, QUE.

IF YOU ARE INTERESTED IN THE CUTTING OF TAPER SCREW THREADS OF ANY KIND OR SIZE

THE GEOMETRIC TAPER THREADING DIE HEADS applied to the turret of your Screw Machine or Turret Lathe will give you accuracy and large production at a very low cost of installation.



Better than a special machine, for it leaves you the Screw Machine for other work when not cutting tapers.

Write to-day for particulars, and tell us your requirements.

The Geometric Tool Company

New Haven, Conn., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Quebec; A. R. Williams Machinery Co., Toronto, Ont.

STARRETT TOOLS

ARE THE STANDARD

FOR ACCURACY, WORKMANSHIP, DESIGN AND FINISH

Improved Levels for Testing Shafting, Etc.



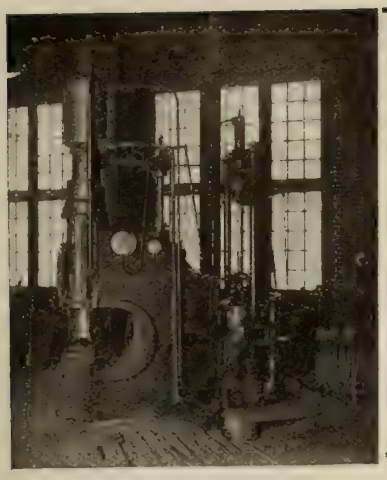
In addition to the regular parallel vial, the bases have a cross level which enables one to place or hold the base on a shaft level in its cross section, not canted sidewise: for the shape of a level glass is such that, though true as adjusted on a flat surface, it will not be reliable when canted sidewise. Hence the value of the cross level, not only to test the truth of shafting, but other surfaces which tend to throw the level base into a canting position.

The base of this level has our improved concave running through the length of its base, leaving a flat margin each side, which improves its seat for flat work, while forming an absolutely true and reliable seat for shafting, etc., and it is better than a V groove. Made in 6, 8, 12 and 18 in. sizes, with plain vials and with plain and graduated vials.

Send for free Catalogue, No. 173, of Fine Mechanical Tools.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.



High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

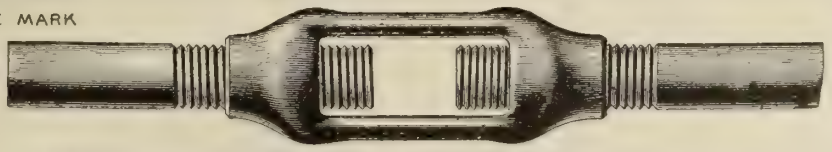
Small sizes single-frame type. Large sizes four-column type.
Built for doing all classes of forging, shearing or pressing.

100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.
2305 Farmers Bank Building, PITTSBURG, PA
EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO.
Manufactured under Davy Bros., Ltd., Patents.

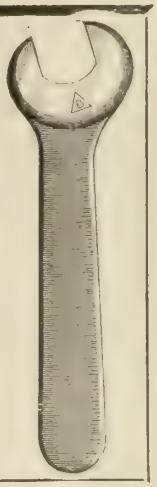
B Drop Forged Turnbuckles

TRADE MARK



ALL KINDS OF SPECIAL DROP FORGINGS
Send Models o Blue Pints fo Estimates.

Machine Wrenches
Screw Drivers
Pliers
Structural Wrenches
Track "
Eye Bolts
Lathe Dogs
Etc.



Canadian Billings & Spencer, Limited Welland, Ont.

ARMSTRONG
DROP FORGED STEEL LATHE DOGS



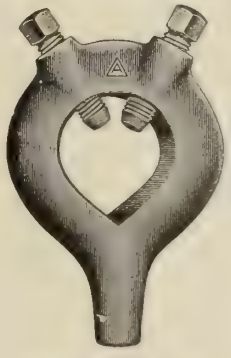
All Kinds
All Sizes
3-8 in. to 8 in.

POINTS OF EXCELLENCE

Uniformity of design.

Tool steel set screws with our improved beveled point which prevents upsetting.

No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.



HEAVY DUTY DOG

Write for Special Circular and Discounts.

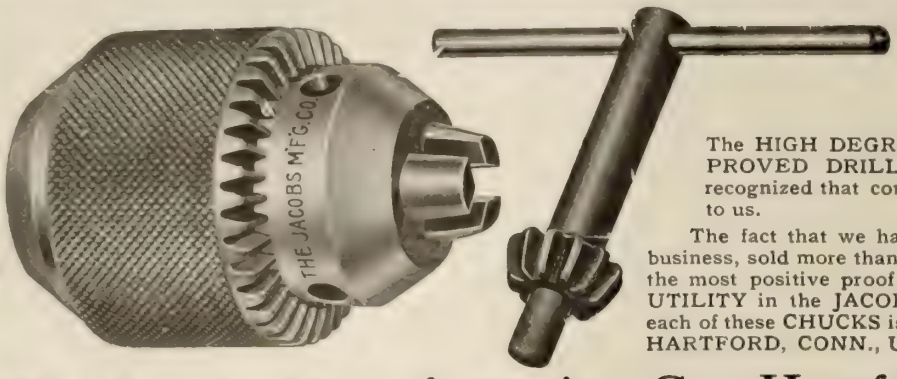
Have Armstrong Quality

Best Obtainable in Design, Workmanship and Material

If you Want the BEST Specify ARMSTRONG Drop Forged Dogs



Armstrong Bros. Tool Co., "The Tool Holder People" 106 N. FRANCISCO AVE., CHICAGO, U. S. A.



Utility

The HIGH DEGREE OF UTILITY in the JACOBS IMPROVED DRILL CHUCK is so great and universally recognized that competitors have become almost unknown to us.

The fact that we have, in the seven years we have been in business, sold more than 90,000 Jacobs Improved Drill Chucks. is the most positive proof of the recognized HIGH DEGREE OF UTILITY in the JACOBS IMPROVED DRILL CHUCK. On each of these CHUCKS is printed: "THE JACOBS MFG. CO.,—HARTFORD, CONN., U.S.A.—PATENTED SEPT. 16, 1902."

The Jacobs Manufacturing Co., Hartford, Conn., U.S.A.



Engineers and Mill Owners

"LOOK UP" not the cost of your

BABBITT METAL

but the cost of your many shut-downs caused by the use of inferior Babbitt Metal. Use THE CANADA METAL CO.'S METAL and stop that needless expense.

Office, 31 William Street, - - Toronto

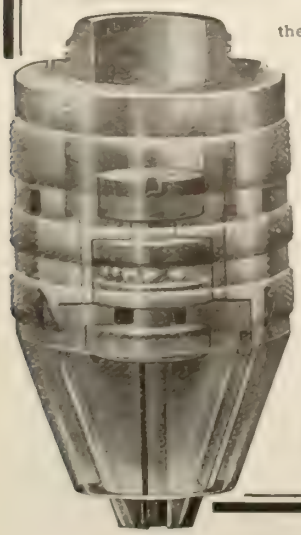
Holds Straight Shank Drills

Without Slipping!



This is only one of the features that recommends the

Russell Anti-Friction Drill Chuck



the chuck with the grip that positively will not slip

The "RUSSELL" is adjusted with a simple turn of the wrist, no hammer, no spanner and no wrench required. Roller bearings eliminate friction.

SEND FOR CATALOGUE

Distributing Agents in Canada

The General Supply Company of Canada, Limited

Ottawa, - - - Canada.

Made by
Russell Anti-Friction Drill Chuck Co.,
Elmira, N. Y.

You want it in your shop!



A most efficient and satisfactory tool, which should find a place in your shop, is

BLOUNT'S

Wet Tool Grinder

It is very economical to run and can be run continuously if desired. This grinder is fitted with self-oiling bearings, and there is no wear of parts, because the propeller of the pump, furnishing a a constant supply of water, is loosely fitted, and does not touch the case at the nearest point. A sleeve cap prevents leakage without the use of packing.

SATISFACTION GUARANTEED.

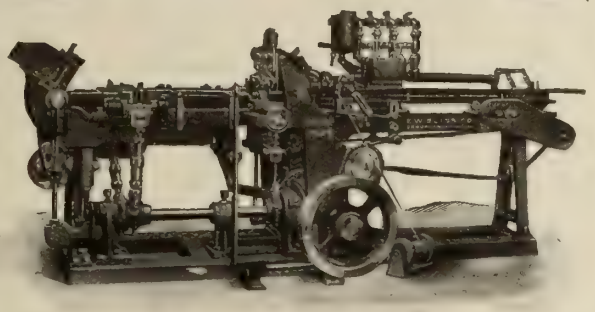
Send for further details.

J. G. Blount Company

EVERETT, MASS., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

BLISS **Tin Can Machinery** BLISS



Bliss Patented No. 12N Body Making and Soldering Machine

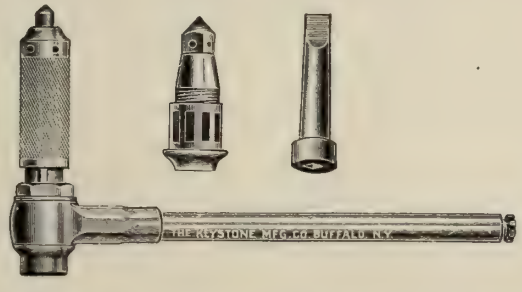
OUR machines give greatest production with most economical tin and solder consumption. We furnish complete equipments for making Open Top and Packers' Cans for fruits, vegetables, fish, meats, soups, condensed milk, etc., also for paint and varnish cans, baking powder and spice cans, lard pails, butter tins, tin boxes and packages of every description---round, square, oval and oblong. Send samples, state requirements. See what we can do for you.

On Request Can Machinery Catalog 14G

E. W. BLISS COMPANY

20 Adams St. - - BROOKLYN, N.Y.

London Office---114 Queen Victoria St., London, E. C., England.



A handy combination tool

that every mechanic should have in his kit is the

"KEYSTONE"

Reversible Ratchet No. 200

CONSISTS OF

Ratchet for Taper Shank Twist Drills
Sleeve for Square Shank Drills
Short Boiler Socket for Square Shank Drills
(Sockets Interchangeable)

SEND FOR COMPLETE CATALOG.

THE KEYSTONE MFG. CO.

Buffalo, N.Y., U.S.A.

Files that Cut Clean and Fast



are the only files worth having. And there are no files that give equal satisfaction in this respect to these well-known, Nicholson-made Brands.

American
Arcade
Great Western
Globe
Eagle
McLellan
K. & F.
J. B. Smith

The steel used in these files is made especially for us from a formula evolved during the many long years' experience as specialists in the manufacture of files.

Nicholson File Co.

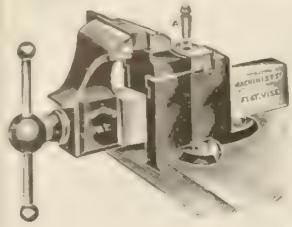
(Dominion Works)

PORT HOPE - ONTARIO



HINTS TO BUYERS

Do Not Be Misled by Inferior Imitations.



There is but one

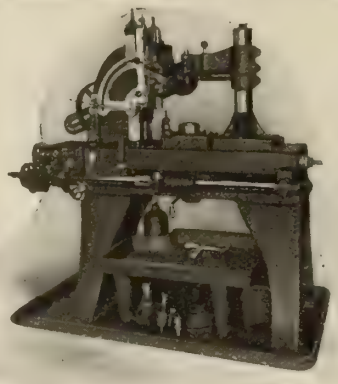
PRENTISS VISE

Made by

Prentiss Vise Company

Hardware Building, 106-110 Lafayette St., Cor. Walker St., NEW YORK

Canadian Agents: A. McFarland & Co., Coristine Bldg., Montreal



The Whiton

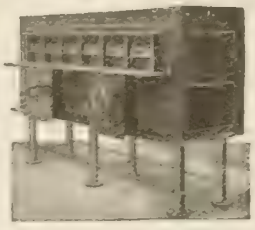
AUTOMATIC

Gear Cutting Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.



Rockwell

Muffle Hardening

Furnace

For hardening all small articles which require perfect uniformity and freedom from oxidation or scale.

WRITE FOR CATALOG No 26

W. S. ROCKWELL COMPANY

Hudson Terminal Bldg., 50 Church St., NEW YORK

(The Original Furnace Rockwell).

CUT GEARS

THEORETICALLY CORRECT

IN

RAWHIDE OR METAL

ROBERT GARDNER & SON LTD

Nazareth St. ~ MONTREAL

H & E PATENT BALL BEARING LIFTING JACKS

for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.

Made in plain and foot lift styles, fully guaranteed.



Manufactured by

H & E Lifting Jack Company

WATERVILLE, QUE.

Stock carried by F.H. HOPKINS & CO. Montreal

The Alexander Engraving Co.

Half-tone Cuts and Zinc Etchings

Designing & Drawing.

We are producing the very highest quality of machinery cuts from retouched photos and wash drawings.

We want your next order.

Write Us, Phone Us or Call

352 ADELAIDE ST. WEST, TORONTO.

The advertiser would like to know where you saw his advertisement—tell him.

Thor

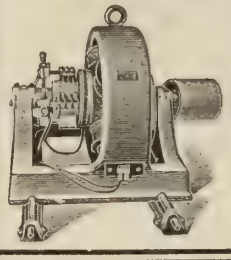
AIR TOOLS
ARE SUPREME
MECHANICALLY
AND ECONOMICALLY.

They are easily superior to all others in power, durability, ease of handling economy of air consumption and general efficiency. THOR TOOLS are simple in construction; they run without vibration, and little attention and repairs are necessary. ADOPTED AS THE STANDARD IN THE PRINCIPAL PLANTS THROUGHOUT THE WORLD.
SENT ON THIRTY DAYS. TRIAL—express charges paid both ways if unsatisfactory. WRITE FOR DESCRIPTIVE MATTER.
Made in fifty different sizes covering every possible Air Tool requirement.
Exclusive Canadian Agents. G. W. PETRIE, LTD., 131 Front St. W., Toronto Cor. St. James and Little St. Antoine Sts., Montreal; 422 Abbot St., Vancouver.

INDEPENDENT PNEUMATIC TOOL CO.
CHICAGO · NEW YORK · PITTSBURG · SAN FRANCISCO

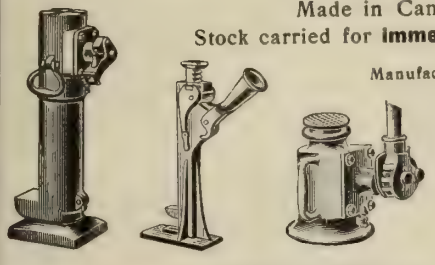
YOU NEED MORE LIGHT
IN YOUR FACTORY WRITE

TORONTO & HAMILTON
ELECTRIC CO.



MANUFACTURERS OF
Dynamos
for Light and Power
AND ALL
ELECTRICAL APPARATUS

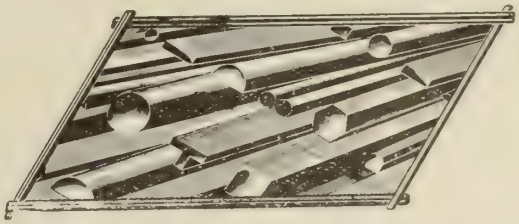
NORTON JACKS
Standard on the Leading Railroads
Made in Canada.
Stock carried for **immediate shipment.**



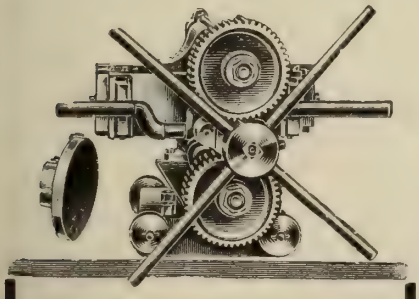
Manufactured only by
A. O. NORTON,
COATICOOK,
Prov. QUEBEC.

STOCK CARRIED BY
MUSSENS LIMITED, - Montreal and Winnipeg

Union Drawn Steel Co., Ltd.
Hamilton, - Ontario



Manufacturers of
Bright Finished Steel Shafting and Shapes
Large Stock of all Sizes. Send for Price List.



PATENT
Shaft Straightening
MACHINE

For use on the Lathe.
NO HAMMERING

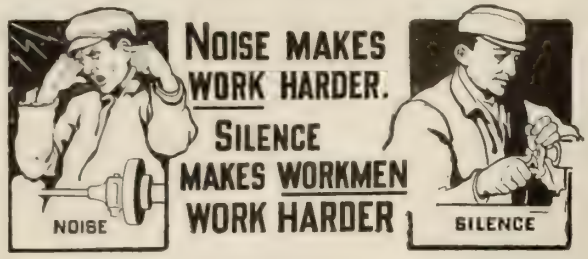
For round or square Bars, Cranks, Tubes, Etc.

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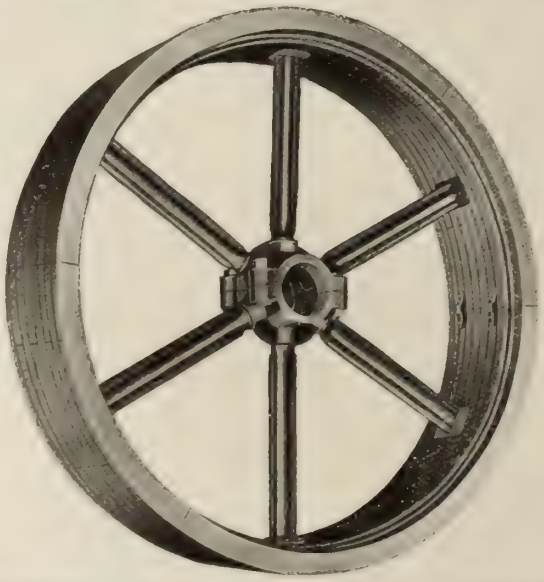
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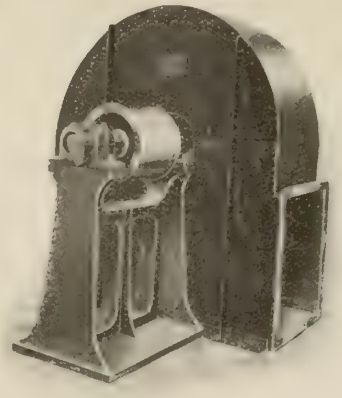
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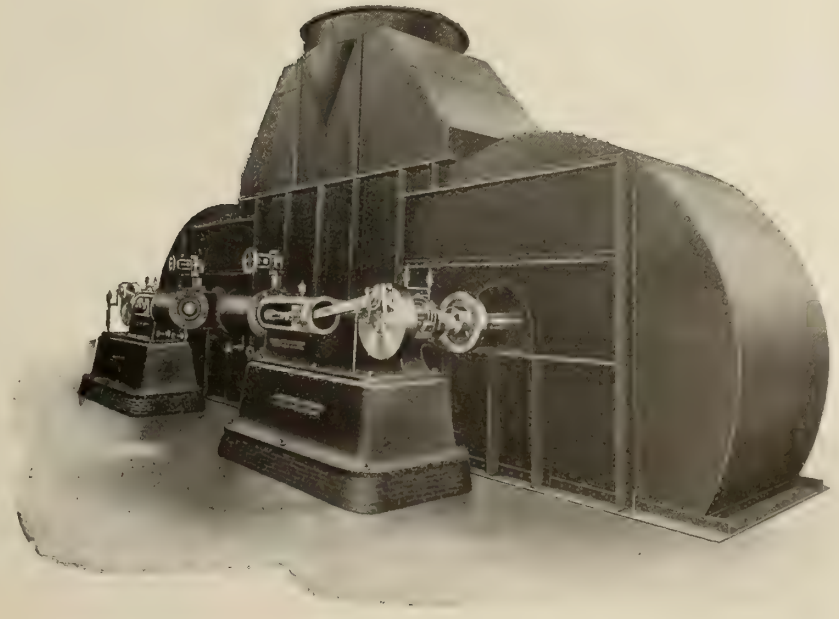
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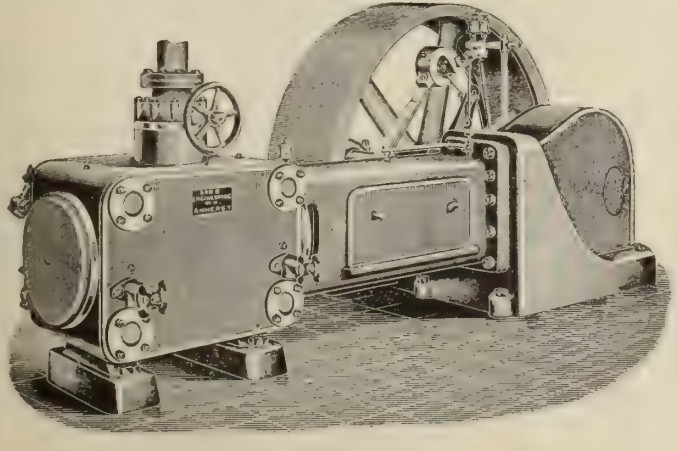
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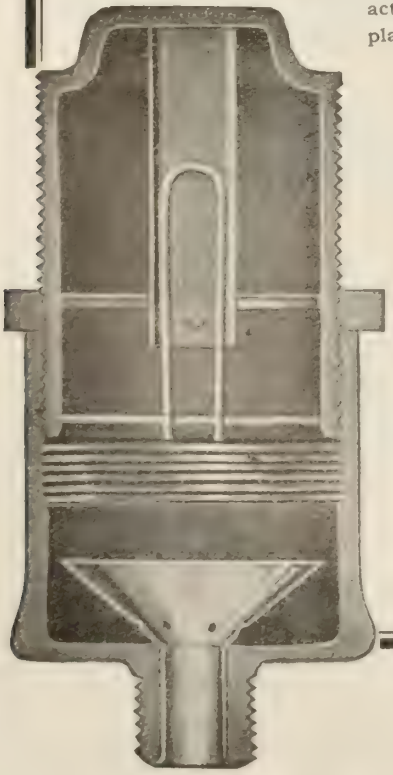
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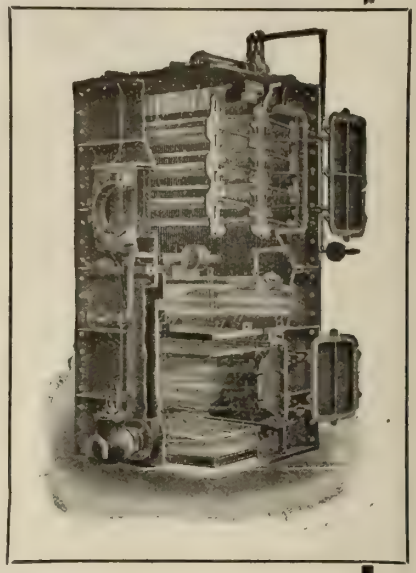


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Department of Commerce and Labor

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October 19, 1910.

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Being short of a set for installation at one time I cast a set on mandril and plaster of paris moulds, using Magnolia Metal, with such good results that I at once fitted all rods in a similar manner, the soft rings not being machined or scraped to place in either application, they ran for four months under my care without trouble, and I have since been informed that they were taken out two years after I left the vessel, worn out.

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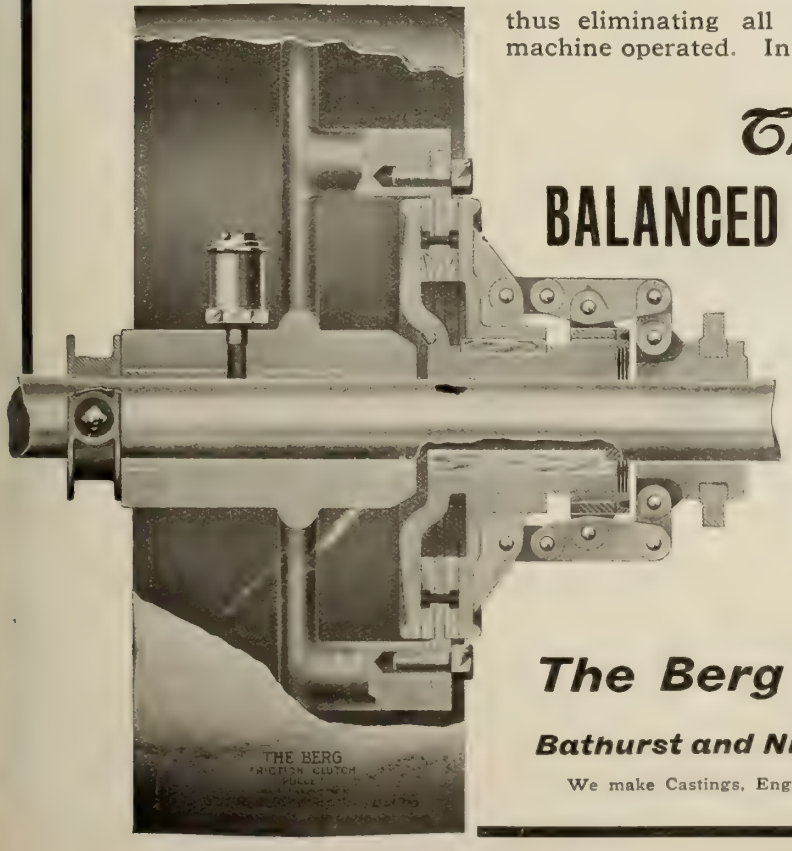
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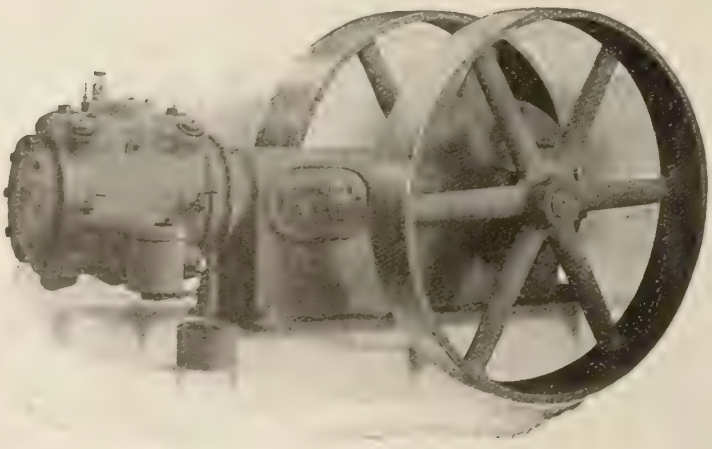
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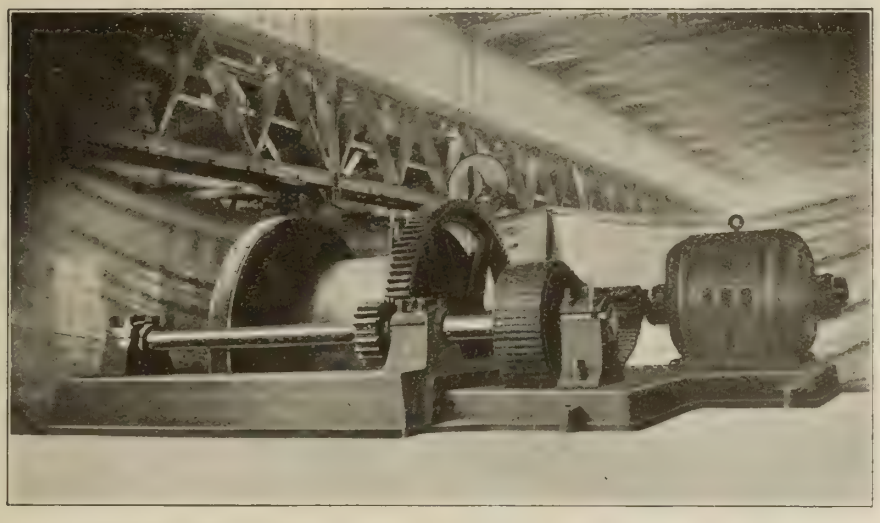
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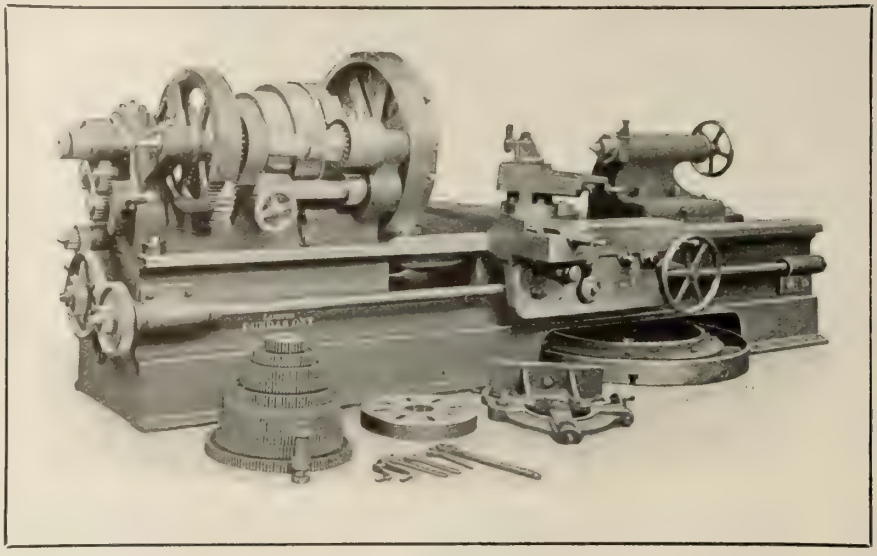
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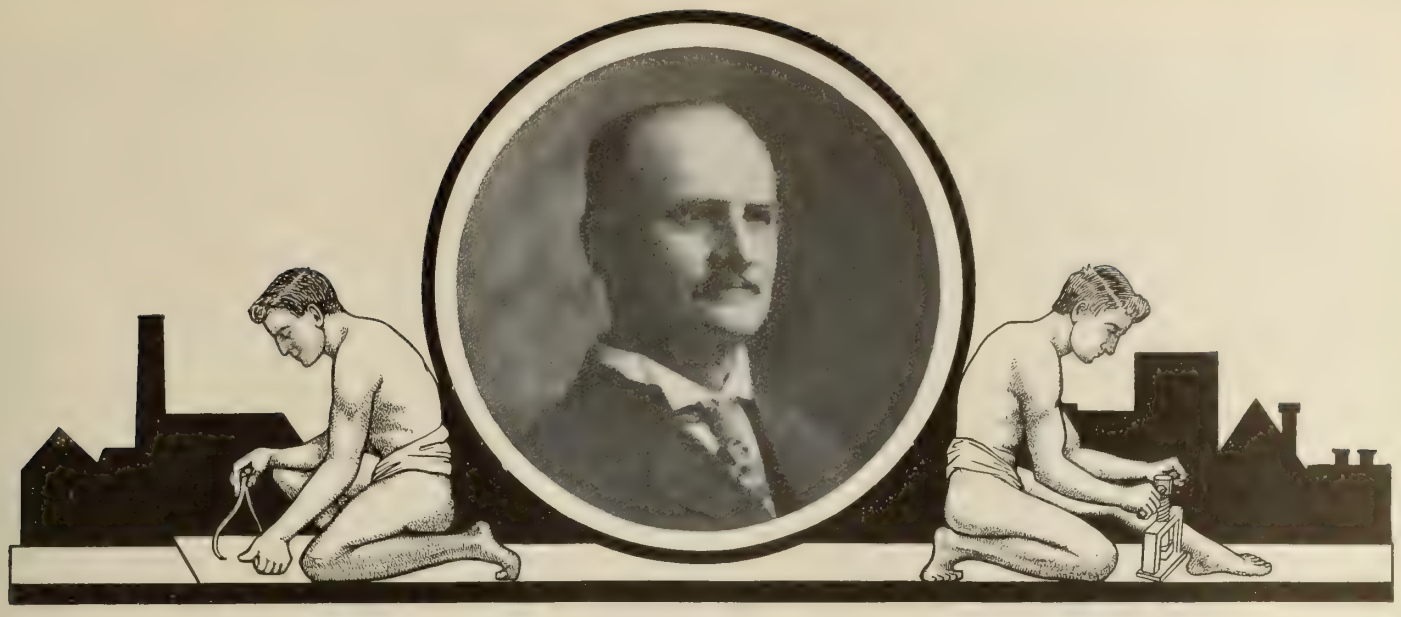
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The Field for Commercial Grinding*

By C. H. Norton * *

GRINDING in various forms has been known to man from the very beginning of history, yet it is doubtful if many engineers have a clear conception of the field for metal grinding. Experience (as a specialist) covering twenty-five years has taught me that the usual thought of grinding is that it is a slow, tedious, expensive, but sure method of obtaining accuracy, and that where great accuracy is not required grinding should not be done.

When, within the recollection of the writer, mechanics made their own solid glue and emery wheels with which to grind small hardened tool work, it did not occur to them that they could do by grinding a certain part of the work that they were using steel tools for, because it was grinding, and was slow. Moreover, all nice work must of necessity take lots of time, because our older mechanics had said so. It did not occur to them that we could ever have better grinding wheels and better machines in which to use them.

It was at this point in our reasoning that the majority of engineers rested and it is here that we find a large number now. All engineers admit the exactness of grinding, but most of them still believe it to be slow.

Appleton's Cyclopedia of Applied Mechanics, published as late as 1893, says that emery wheels are employed mainly for producing cutting edges and for smoothing surfaces. Again it says that in all cases of the employment of emery wheels in place of steel cutting tools, the operation is considerably slower, and it may be laid down as a rule that save upon metal too hard to be operated upon with steel tools, the emery wheel cannot compete with the ordinary lathe, planer, milling tool, etc. My observations convince me that a great many American engineers hold the same views.

What the Wheel Will Do.

As a specialist for many years, I have seen a gradual but sure increase of knowledge of grinding and have noted the widening of the field as the result, but I am not aware that the intelligent study of grinding has been taken up by professional engineers or by any institute of technology. The intelligent use of grinding yields such large returns that it warrants careful study by the very best engineering and scientific minds and a place in the courses of our technical schools. The field is constantly broadening with each year's improvements in grinding wheels and grinding machines, and it is time that men of brains and education took a hand with us to help the world to a better knowledge of the science of grinding and grinding wheels.

The results thus far attained warrant a change of the world's idea of grinding and instead of using it as a synonym for slowness, tediousness and drudgery, it should be a synonym for rapidity, accuracy and economy.

The fact that grinding with the modern grinding machine and grinding wheel (not emery wheel) is that it enables us to size all around work cheaper than by turning and filing, that it takes the place of what we formerly called the finish cut of the lathe and all filing, giving us not a theoretical perfect cylinder or perfect finish, but a much nearer perfect cylinder and finish than we obtained with the lathe. It gives us diameters to such small limits as to be called exact, but whoever insists that none but exact work be ground loses the very pith of grinding, which is economy. Modern grinding means cheaper cost for all work, many grades of work to suit many requirements, and cheaper turning than is possible without the use of the grinding machine.

As a rule, the coarser the turning the greater the economy by grinding. The greatest economy is obtained by the combination of cheaper turning and grinding. It is no longer necessary to turn work smooth, straight or correctly to size, and the lathe is no longer necessary as a precision tool. If it has a carriage traverse of from four to ten threads per inch, has sufficient power to carry high-speed tool cuts at that feed and is well supplied with steady rests to prevent springing of the work, it is ready for co-operation with the grinding machine. It is easier with modern grinding machines and wheels to grind off a given amount of metal when in the form of crude screw threads than in any other form, and with long work having several sizes the grinding requires less time if 1-32 to 5-64 inch is left on the diameter for grinding than if the work is turned carefully to within 0.002 to 0.005 inch. In all cases, accurate turning increases the total cost of production and in some it makes the grinding very expensive. The greatest economy is usually obtained by the combination of grinding with rough turning. Yet there are cases where the least expensive way is to grind direct without turning, notably the greater part of crankshafts of automobiles and small gas engines and very long and slender work where turning is difficult.

*Abstract of paper read at New York meeting of American Society of Mechanical Engineers, December, 1910.

**Norton Grinding Co., Worcester, Mass.

It is not an easy matter to secure such rough turning as true economy requires in connection with grinding. Lack of knowledge of what is needed, coupled with the natural pride the workman takes in doing what tradition says is nice lathe work, prevents the grinding machine from doing what it is ready to do. Our industries are losing much while waiting for the engineer to assume the intelligent guidance of foreman and workmen who, through fear, doubt or prejudice now rob us of the great economies due to modern grinding machines. There is much yet to be learned by foremen and workmen about turning. High-speed steel makes possible much that has not as yet become common knowledge.

The lathe is a very old tool and foremen and workmen have known it for generations, yet I have been unable to find more than two instances where a careful study has been made of the combination of lathe work and grinding to effect the maximum saving. I have observed that lathe men have not tried to remove metal by increasing the number of cuts and using fast traverse. When urged to take coarse feeds to help the grinding machine to effect a total saving, they have invariably said that they were feeding all that the work would stand. It has been demonstrated that three cuts with a carriage traverse of 6 per inch produced certain work in 9 minutes that required 13 minutes to turn in one cut, because the work was so frail that with one cut no faster feed than 32 per inch could be taken. The rough-ridged surface was readily ground by taking one minute more than when the turning was finer, the net saving for the job being three minutes. In many cases the ridged surface requires no additional time.

In another case where the work was quite firm and was being revolved at a very high speed with a view to getting everything possible from the high-speed tool, the turning required five minutes and the grinding one minute. A change was made in the feed of the lathe so that without revolving the work any slower it was turned in one minute, leaving a very crude, crooked and bad-looking piece of lathe work. The grinding then required two minutes, but the net time saved was three minutes. What did it matter how bad looking a lathe job it was if the finished work was perfect and three minutes was saved?

Grinding Makes Old Tools Useful.

There is a rich field for engineers and managers in connection with the lathe and modern grinding. Recent lathe designs provide for high speed of revolution, with sufficient power, quick change to and from back gears, and sufficient rigidity to utilize to the limit high-speed steel, but much work is not of sufficient rigidity to permit the maximum use of the tool at fast traverse and deep cuts. In addition, there are thousands of lathes of old design that will not be thrown away at once. There is, therefore, an opportunity to get much more out of present plants by cheaper turning because of grinding.

Developments warrant the conclusion that we should no longer assume that simply because a tool is a grinding wheel it cannot remove metal and size and

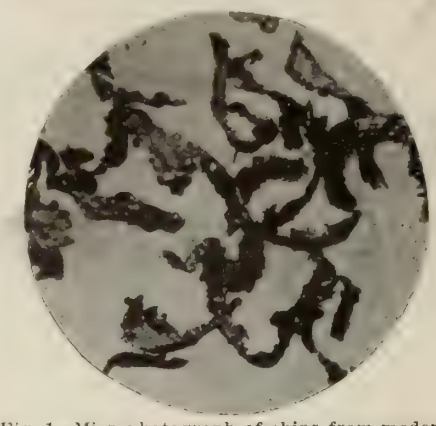


Fig. 1 Microphotograph of chips from modern grinding wheel. Note the resemblance of .. these fragments to lathe chips.

shape work as quickly as a steel tool. Rather, we should use the steel tool when it can be made to remove metal, size and shape work cheapest, and the grinding wheel when it excels. It is no longer to be taken as a matter of course that we can turn, plane and mill faster than we can grind. After all, the real reason we

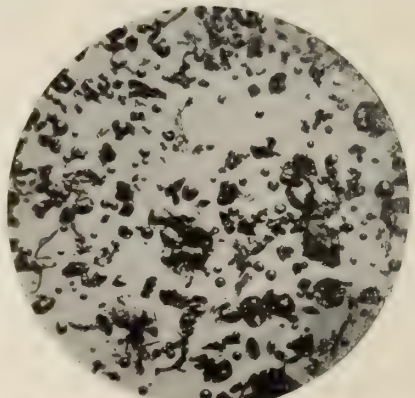


Fig. 2 Microphotograph of chips from modern grinding wheel.

remove metal is to accomplish certain finished results, not simply to secure a certain number of pounds of chips in a given time. Before long I think all progressive engineers will understand that both the grinding wheel and the steel tool have their place for metal cutting. The old thought of abrasion must give way to the new thought of cutting.

While it is still true that poor wheels or good wheels poorly selected and wrongly used will still remove metal very slowly by abrasion, it is also true that the old-fashioned milling cutter, with fine teeth cut by hand with a file, hardened but never ground, and used in the old-time slender milling machine would very slowly abrade the surface. The modern grinding wheel, used in a modern machine by a modern man, is just as surely a milling cutter as if it were made of steel.

The microscope reveals the fact that such a wheel cuts off chips. Fig. 1 is from a microphotograph and clearly shows the chips that are as surely cut off as those made with a steel milling cutter. The grinding wheel used was a modern one made of crystalline aluminum oxide.

Fig. 2 is also from a microphotograph and shows the result of the old-fashioned abrasion described by Webster as grinding to powder. Here we see the effect of great heat, the greater part of the powder being in the form of globules. This is magnified to the same extent as Fig. 1 and shows the vast difference between the old-time abrasion to powder and the present cutting chips. A large part of the energy put into work was wasted in heat, as shown by the very small globules in Fig. 2. The wheel used for Fig. 2 was an emery wheel like those referred to in Appleton's Cyclopedia of 1893.

TARIFF ON RE-ROLLED RAILS.

For some years rails which have been re-rolled in the United States have been admitted into Canada on payment of a duty equivalent to 25 per cent. of the work done on them. The Canadian government has issued an order-in-council which states that a mill has been established in Canada adapted for re-rolling rails used on railway tracks weighing not less than 56 pounds a lineal yard when re-rolled, and orders that the special duty on such re-rolled rails shall be abolished and that they shall be subject to the general tariff. Hereafter rails re-rolled in the United States can only be re-imported on the payment of $7 per ton. It is charged that new rails have been brought in as re-rolled rails.

INCREASING THEIR STAFF.

Merril Z. Fox, for the past six years connected with the Hill & Griffith Co., Cincinnati, has joined the Detroit Foundry Supply Co., of Detroit, St. Paul and Windsor, Ont., as vice-presdent. The Detroit Foundry Supply Co. announce also that they have secured the services of J. H. Lyle who will cover the states of Illinois, Wisconsin and Iowa, and H. E. Moyer, who will cover the states of Indiana, Ohio and the Dominion of Canada. The Detroit Foundry Supply Co. are congratulating themselves on securing the services of these men who understand the foundry lines thoroughly.

Efficiency of Tools and Economy in Their Manufacture

By W. M. Townsend *

Some Points From a Paper Read Before the Canadian Railway Club, Relative to the Making of Cheap and Efficient Tools, Including Milling Cutters, Tools for Lathes, Planers, Shapers and Slotters; Drills and Reamers.

VARIOUS kinds of milling machines are becoming more prominent in removing surplus stock from machine and locomotive parts, hence the necessity of having durable milling cutters.

To obtain an efficient milling cutter there are two points which are essential, namely high speed steel and a spiral or helical cutting edge. The latter quality may not appeal to some, due to the fact that an inserted tooth cutter made from a mild steel body with a high speed steel blade inserted at an angle of about 12 degrees, answers fairly well. This, however, is a great mistake. To obtain a clean cut it is necessary to have a certain and constant angle of rake or lip to the milling cutter. This can be obtained only by having a helical or spiral cutting edge.

To construct the milling cutter that will give the best results and still adhere to the principle of strict economy (the point which I wish to emphasize mostly in this paper), we must first of all consider its diameter. We will first speak of cutters having a diameter of over 6 inches. Keeping close to our principle of economy, we apply to the scrap heap for material; there we will find crop ends of billet steel sawn from the ends of driving axles, which make an ideal body for an inserted tooth high speed steel milling cutter. The scrap value of these crop ends is very small, hence the low cost for the body of the cutter. Now, to procure high speed steel for the blades in an economical manner (which if cut from the steel bar would cost 50 cents per pound), we collect all the broken and short high speed tools that cannot be further used on planers, shapers, lathes, etc. These are hammered into blades $\frac{5}{8}$x1$\frac{1}{4}$x5 inches long. The cost of material for the blades is covered by the cost of labor in hammering out the steel plus its scrap value, which is very small. So much for the economy in procuring material.

We will now turn our attention to the design, upon which depends the efficiency. The bodies, after having been bored, turned, and faced, are milled with slots $\frac{5}{8}$ in. wide, $\frac{3}{4}$ in. deep, 1$\frac{1}{2}$ in. apart, at an angle corresponding to a predetermined helix or spiral. The blades are then fitted and slightly calked. The cutter is then set up on a universal milling machine, and the front of the blades milled spiral. This gives a constant angle of rake or lip from one end to the other. This insures an equal strain along the whole length of the blade. On the other hand, if the blades are merely put in on an angle and not milled spiral, the lip or rake of the cutter is irregular. It can readily be seen that from one end of the cutter to the centre there will be a decreasing lip, while from the centre to the other end of the cutter there will be an increasing drag. This causes an unevenness in the cut and also a tendency to break and pull out the blades on the drag side. So much for cutters having a diameter over six inches.

Inserted tooth cutters with a diameter much less than six inches are not practical, due to the fact that a slot cut at an angle across the top of the cutter body would be very irregular in depth, hence the impossibility of holding the blade. Take for example a blank cutter body 5 inches diameter, 10 inches long, cut a slot through the top at an angle of about 15 deg., you would have a depth of about $\frac{3}{4}$ inch in the centre, while at either end there would be no depth to speak of. This can be avoided, however, by dividing the cutter into short sections, thereby lessening the unequal depth caused by cutting a slot at an angle to the axis of the cutter, but the high cost of this method does not warrant its adoption.

Cost Figures.

The general practice, in making cutters of smaller dimensions, is to use carbon steel costing about 14c. per pound. This is altogether unnecessary and extravagant. Billet crop ends selected from high carbon billets such as are used for driving axles, piston, and side rods, carefully hammered, outclasses in every way the ordinary tool steel. In the first place its cost, hammered to size, is about 11$\frac{1}{2}$c. per pound, as compared with 14c. per pound for tool steel. Secondly, it is tougher, and the teeth will not break when a heavy cut is put on, such as is the case with tool steel, and the cutting edge stands up equally as well. The success of this method, of course, depends upon the treatment of hardening. This, however, is very simple, and consists of carefully packing the tools to be hardened in a mixture of salt and raw bone, placed in an air-tight box, which should be brought and kept to a heat of 1,500 deg. Fah. from 24 to 48 hours according to size, then drawn from the box and quickly immersed in running clear water. There is no need whatever of drawing the temper, as the cutting edge has the correct hardness, while the body of the cutter remains very tough.

Hardening Cutters.

The question that you would naturally raise at this point would be: How deep can cutters be hardened in this manner? I may say that a depth of 3-8 inches can be reached, or in other words the cutter may be ground until the tooth is almost ground away, leaving no space for the chips to get away. When a cutter reaches this stage, it can be annealed, recut, and rehardened, as often as the thickness of material will allow, without affecting the quality of the cutter.

Some three years ago a test was made at our works to determine the advantage of using high speed steel cutters for a certain class of work, namely—milling out jaws of side rods, transmission bars, radius bars, combination levers, etc. It was found that the high speed steel cutters broke from the vibration and pressure brought to bear upon them, whilst cutters of the same design made from billet steel case hardened, did the work very satisfactorily without breaking, running at the same speed and feed. I wish to remind you that what I have said so far regarding milling cutters refers to cutters used for straight milling. Cutters used for milling gears, taps, reamers, and irregular shapes should, in my opinion, be made from high speed steel.

In studying the efficiency and economy of tools, we must not forget to consider the quality and quantity of work required of them.

Tools for Lathes, Etc.

We now come to tools such as are used on lathes, planers, shapers, and slotters. There are many brands of high speed steel on the market at the present time, and I have tried almost all of them, but will not express my opinion regarding their merits, as it would make this paper appear as an advertisement. I believe, however, that if we wish to ascertain which is the most efficient steel, we should give every

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brand an extensive trial, making an individual record of each, and determining which is the best, as compared to the price paid for it. Different shops have different materials to contend with, and the formulae used in the composition of steel differ, so that some brands are better for cutting one class of material, while other brands are better for cutting other classes of material. This is why I contend that each shop should test out every brand and see which is best adapted for its requirements.

Using High Speed Steel Tips.

High speed steel is an immense item in large machine shops, and great care should be exercised in order to avoid waste. A great saving may be made, by observing the following practice. In making finishing tools, instead of using a piece of high speed steel, say 1¼ in. by 2¼ in. by 15 in. long, costing about six dollars, we go back to the old reliable, and use a piece of billet steel, leaving it as large as the tool post will admit, and weld a tip to it made of high speed steel. The finished cost of this tool is about one-eighth of the solid high speed steel tool and is just as efficient for these reasons: The billet steel is sufficiently strong to withstand the pressure brought upon it for a finishing cut. It does not require dressing any oftener than the solid tool, but it does require a little more care.

I will now explain a little more clearly how this tool is made. As stated before, we take a piece of high carbon billet from the scrap heap, and draw it out to the required dimensions. One end is then scarffed ready to receive the high speed steel tip which is wedge shaped. The toolsmith fits the two parts fairly well together before welding to ensure a neat weld. The parts after having been prepared are then heated, the tip being allowed to heat longer than the body, owing to the necessity of the former being of a much higher temperature than the latter to allow for welding. When both are at a welding heat they are quickly withdrawn, a piece of Lafitte welding compound is placed between them and hammered lightly together. The tool is then reheated, care being taken to place the nose of the tool in such manner that it will be most exposed to the fire, When the required heat is reached the tool is quickly withdrawn and placed between a former under a steam hammer and given a light sharp blow. In case of the tip being displaced, it will not do to try and knock them into place again. The tip must be cut away and refitted, and a fresh piece of the compound used. The tool is then treated in the same manner as a high speed steel tool. These tools have been used until the tip has been ground right down to the weld.

I would not advise making heavy roughing tools in this manner, as the billet steel body would not stand the pressure required by a roughing tool such as is used on a heavy planer. A tool of this description, however, answers well when used on a lathe where the point does not project far from the tool post, also where the cut is continuous and not intermittent, as is the case on a planer. You can readily see where the saving comes in, if this method is only applied to finishing and lathe tools.

Twist Drills.

I will now draw your attention to twist drills. Twist drills made from carbon steel with the exception of jobbers' drills, that is, drills up to ½" diameter, are almost a thing of the past, high speed steel drills having taken their place. The original design of the high speed drill was exactly the same as the ordinary carbon drill with the exception of the material used. This, however, has proven to be inefficient and expensive due to the following reasons: In the first place, to obtain proper results from a high speed drill, it is necessary to have adequate space to allow the chips to free themselves from the drill, as the flutes will soon choke up owing to the increased feed and speed of the drill. The fluted high speed drill has not this advantage. It is expensive for this reason. To make a drill of this design, it is necessary to use a round bar of solid steel, cutting away 50 per cent. of it to form the flutes. Yet there are men who will tell you that this design of drill is the best and cheapest on the market.

Best High Speed Drill.

I will now give my opinion as to which is the best high speed drill and the reason why. A high speed steel drill with a twisted section about half way between the flat twisted section and the standard milled drill is the most efficient and economical, from the fact that it takes just one-third of the steel to make it, and efficient because of the adequate space for the chips to clear, thus preventing clogging and choking. The feed can be doubled due to this advantage. I have found in my endeavor to reduce the cost of tools, that in the average shop where locomotives and heavy machines are built, they have sufficient equipment to make efficient high speed drills with a saving from 10 per cent. to 50 per cent. The same may be said of all kinds of taps, especially those used in boiler construction. These remarks may seem severe to the tool supply men here with us to-night, but this is one point which I feel that I cannot leave out, seeing that our subject is along the lines of economy.

Reamers.

A few words may be said regarding reamers. There are many styles of straight reamers, all of which have their advantages, which leaves me with nothing to say regarding them. Taper reamers are different in their action, however, inasmuch as the whole part of the reamer that comes in contact with the work is cutting equally, whereas, in the straight reamer, the extreme end is the only part that cuts, the rest of the reamer only acting as a guide. It is this difference of action that I now wish to discuss. In all railroad shops there is a great amount of taper reaming to be done; this calls for a different class of reamer. Having visited some of the large locomotive works and enquiring from others, I find that their practice is to use the straight fluted taper reamer —some of them have the teeth staggered, others equally spaced. I beg to state that this style of reamer is decidedly wrong. Reamers that are required to cut equally their full length of flute should be milled with a left hand spiral cutting edge, having an angle of about 20 deg.; the pitch or distance between the teeth should be about ¾", leaving ample space for the chips to clear, thus preventing clogging and tearing of the hole. The advantages of this style of reamer are: It takes about 30 per cent. less power to drive it; it never chatters; it never digs in; the tang does not twist off; the teeth do not break off; they are easy on crank shafts and can be driven with an air motor, where straight fluted reamers would stick. Now this may appear that I am claiming a little more than what is true, but these are actual facts that have been tried and proven.

There are two reasons for the success of this style of reamer, namely, the spiral cutting edge which gives the reamer a shearing action instead of a straight drag (which must necessarily follow with a straight flute), also to the fact that the line of cut parallel to the length of reamer is divided, due to the angular cutting edge which is not parallel to the line of cut. The even and regular curl of chip made by this reamer will also convince you of the correctness of design. The cost of these reamers is a trifle less than the straight fluted reamers, on account of the fewer number of teeth to be cut. This applies generally to reamers having a diameter of 1½" and under, with a flute of from 14" to 16", standard taper 1-16" to 12".

Large Diameter Reamer.

A word or two may be said regarding reamers of large diameter, such as crosshead reamers both for piston and wrist pin fit. For cheapness and durability these may be made in the same manner as solid milling cutters, as mentioned in the previous part of this paper. Select

a piece of high carbon billet from the scrap heap, have the forging well hammered, machine and case harden, and you will have a tool that is equal to the finest tool steel made. You will find that the cost will be about one-tenth of that of good tool steel.

There are many other items of interest whereby great savings can be made, but as our subject covers such a wide area, I must confine my remarks to one or two thoughts in general. Before concluding, I wish to state that AN IMMENSE SAVING MAY BE MADE BY ANNEALING ALL BROKEN AND WORN-OUT TOOLS, IMMEDIATELY THEY ARE OUT OF SERVICE. This being done they should be arranged in open bins or racks, so that when the foreman of the tool room requires material, he looks over his stock of annealed scrap (I mention annealed for the reason that very often a piece of scrap material is available, but it is necessary to wait while it is being annealed) and very often finds exactly what he wants without drawing from the regular stock.

Another feature regarding economy, is the correct distribution. I mean by this that EVERY MAN SHOULD HAVE ALL THE TOOLS HE REQUIRES AND NO MORE. I say this because it is well-known fact that workmen have a habit of collecting and storing up under lock and key, all the tools they can possibly lay their nands on, for their own individual use.

You can readily see that with this practice, if not watched and kept in hand, in large plants many thousands of dollars may be invested and nothing accomplished.

In summing up these remarks, I think you will agree with me, when I say that IT IS ABSOLUTELY NECESSARY IN LARGE PLANTS, TO HAVE A MAN THAT IS FULLY ACQUAINTED WITH EVERY DETAIL OF TOOL DESIGN, TOOL PURCHASING, AND TOOL DISTRIBUTION, TO PROPERLY EFFECT A SYSTEM WHICH WOULD RESULT IN EFFICIENCY, AND ECONOMY. I might add that these duties cannot be expected of the tool room foreman, as his duties confine him to the tool room. Under these circumstances the man appointed to perform the duties of economizing in cost, and designing efficient tools, should have the liberty, to watch all machine shop operations, and to have full supervision of tool room practices. This system is in vogue in some of the large locomotive works in the United States and one that I know of in Canada. This system, if adopted by some of the other large plants, would, I feel sure, bring about results worth noting.

A User's View of the Machine Tool Problem*

By John Riddell**

Some Suggestions Looking Toward Improvement in Lathes, Automatic Screw Machines and Drills, With the Idea of Reducing the Number of Operations That These Machines are Usually Made Capable of, so as to Accord More With Actual Service. The Preblem of Safe-guarding Machinery is Dealt With, to Show That Much yet Remains to be Done to Ensure Immunity From Accident Through Carelessness or Otherwise. The Paragraphs on Noise in Machine Shops, and Muslin Pinions, Will Appeal to Our Readers as Items of More Than Passing Interest in the Record of Progress.

IN factories having a very large output, there must necessarily be a great deal of repetition work, such as cylinders, valves, connecting rods, crank and cam shafts, transmissions, etc. It would seem that most of these parts should be made on very special tools.

Lathes.

The writer has been considering seriously for a number of years the advisability of having instead of standard engine lathes, simple turning machines, to produce such pieces as small shafts, which are required in more or less large quantities. It has been the practice for a long time, when if several lathes were required for any particular department, standard engine lathes would be purchased, which machines would be fully equipped with screw cutting, cross feed, rod feed, compound rest, large and small face plates, and very frequently, with an extra block for large outside turning. Experience has taught us, however, that an engine lathe once placed in one of our shafting departments would, in many cases, wear itself out before having to do any face-plate or chucking work, and very seldom, screw cutting. You can, therefore, see that the cross feed, as well as screw cutting, would be superfluous.

Lathes for this work should be equipped with a powerful rod feed, and with a suitable friction device which would slip if the turning tool met with any obstruction, and prevent serious accident to the machine.

Such machines should be so designed that the screw-cutting attachment and cross feed could be readily applied, if in the future they should be required.

Many attempts have been made to solve the problem of small shaft turning, with more or less success, but many of the machines designed for this purpose have been more or less complicated, which precludes the possibility of putting inexperienced men on to run them.

A lathe to be used exclusively for shaft turning, say from about 2 to 4 inches in diameter, would not require the range of speeds as for a standard engine lathe. The lathe I have in mind should have a range of speed of from about 20 to about 250 revolutions per minute for turning, and two or three higher speeds for filing and polishing. These speeds should possibly be between 450 and 600 revolutions per minute. It is desirable in our case at least to have such machines fitted for electric motors. The motors should have a speed variation of about two to one, which, with two or three gear changes, should give all the speeds necessary for a simple turning machine.

Automatic Screw Machines and Turret Lathes.

The automatic screw machine, in a general way, is made so that six, seven, or eight operations can be performed on most any of them. A very large quantity of work going through them requires but two or three operations at the most, such as milling, threading, and cutting off. Many of the screw machines are so complicated that they will perform the operations whether the tools are actually working or not.

It would seem that machines could be very much simplified by making some do three or four operations only.

The same is true of some larger automatic turret machinery. Some of these machines are designed for boring and facing, but nevertheless, the turret will have five or six positions, all of which operations must be gone through with whether there are but one or two

*Abstract of a paper read before the National Machine Tool Builders' convention.

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simple operations to be performed, at the loss of much valuable time.

A great deal might be done toward adapting multiple-spindle heads to single-spindle presses. It is very doubtful if, as at present constructed, it is good judgment to put in too many expensive multiple-spindle drills, for the reason that it takes so long to adjust them for a small number of pieces.

Radial Drills.

Radial drills generally should be so stiffened up as to permit of only the smallest amount of spring to the arm. I believe more drills are ruined by the springing of arms, both under the actual pressure and when a drill is breaking through, than would be if it were not for the springing referred to, as, under the pressure of drilling the arm goes up, and when the pressure is relieved from the point the drills are forced through, and, in many cases catch on the lips and break.

Protected Devices and Wood-Working Machines.

We have had considerable trouble at the Schenectady works of the General Electric Co. lately, in trying to conform to the new State laws, which are very stringent as to the protective devices on machine tools in general and wood-working machines in particular. It is an exceedingly difficult matter to so protect buzz planers and circular saws as to guard against carelessness and the apparent indifference of the workmen, and if someone would devise proper ways and means for protecting such machines he would have the thanks and blessing of the whole manufacturing fraternity.

If an operator has a great many pieces of a similar kind to either saw, plane or shape, he may possibly take pains to apply such guards, which are usually provided, but if, as frequently happens, a man wants to plane one single piece or saw a strip from a board, he will not take time to adjust the safety appliance, and he is very apt to be caught. This would point out the necessity of having some suitable guards which would always be available no matter what the conditions were, and it would seem that people producing this particular line of machinery would conjure up something practicable and effective

Punch Presses.

Punch presses in general are very well designed, but they, like wood-working machinery, are comparatively dangerous to the fingers of careless or dreamy operators. This would suggest automatic feed mechanisms and something to take the piece from the dies after the operation is completed. There have been innumerable devices of this kind exploited, but nothing as yet seems to cover the ground fully.

Another defect in this class of machinery is the fact that in many instances when clutches and other parts come loose, due to wear, they are very apt to repeat the stroke. This frequently happens when a man's hand is between the dies. Such accidents should be impossible until the operator deliberately steps on the treadle.

Noise in Machine Shops.

It has been pointed out that there is a great deal of gear noise in the machine shops of the present day. I am sorry to admit that this is true, but it is not wholly due to the fact that there are more gears used in the construction of machine tools. It is more especially due to the higher speeds at which machines are run to-day, as compared to ten or twenty years ago. Before the advent of high-speed steels 20 feet was considered to be a fair cutting speed for an ordinary steel shaft or a piece of cast iron to be either turned or planed; whereas to-day, we are actually turning shafts at from 75 feet to 125 feet per minute. So it will readily be seen that machines to-day are producing from three to six times more work than they did a few years ago; hence it should follow that there would be more noise due to machine tools producing this extra amount of work. These gear noises are very unfortunate, but we hope by improved gear-cutting machinery and the use of various other materials which have recently been introduced, that this trouble will gradually disappear.

Muslin Pinions.

We have introduced gears at our Schenectady works and pinions made of a high grade of muslin which have been applied to a great variety of uses. We have used one of them on a boilermaker's punch and shear which previously gave considerable trouble, not only on account of noise, but in the actual breaking of the gears; due to excessive back lash and flywheel action on the machine. We had such wonderful success with that particular pinion, which has been running now some two years, that we gradually extended the use until now we are using them on two 10-foot planing machines, which are operated by electric motors and compressed-air clutches, as intermediate pinions for the reverse motion. Heretofore we have tried various substitutes, including bronze, which would go to pieces in two or three weeks; steel would last longer, but made an intolerable noise; rawhide would seem to skrink and burn out quickly, and we very seldom could find anything that would stand the work longer than three or four weeks at the most.

It is perhaps too early to say much about the particular pinions in question, but they have at present been running four months and they have not yet begun to show any signs of distress, and it looks as though their life would be as long as the gears with which they mesh.

Test of Muslin Pinions.

I might ask your indulgence while I describe what has recently been done with a pair of these pinions. As I said before, we have been using them some two years, and are gradually extending their use, and have now fitted up a large department at the Lynn Works of the General Electric Co., where we can produce them in fairly large quantities, but before putting them out in very large quantities we desired to have a life test to destruction, and with this in view we rigged up two railway motors opposed to each other; one of which has a cloth pinion on the armature shaft running into a steel gear on countershaft. On the other end of this countershaft is another cloth pinion engaging with another large steel gear. The other side of this steel gear engaging a cast-gun-iron pinion of the same dimensions as the cloth. This then connects with its shaft and gear to a rawhide pinion on the opposite motor. This particular motor is resisted by rheostats to load the motor which has the muslin pinion. In starting this test it was found that there were no results from a certain load. This load was gradually increased and when after stopping the motors to examine the pinions, through some oversight, an excessive, overload was applied when they were again started. The shock was so severe that it broke about one-half of the teeth from the gun-iron pinion, leaving the two muslin pinions in as good condition as before. Another gun-iron pinion was put on, which also broke. A third was then put on and the load reduced, and the life test has now been running some two or three weeks, and will be continued until some of the gears actually wear out, and not break.

I point this out to show the actual strength of pinions made of this material. So we have reason to believe that with time the noises in machine shops will gradually disappear as they came, without, however, a corresponding reduction in output.

When the belt has become oil-soaked and will not stay on the machine, a good method of cleaning it is as follows: Coil the belt loosely in a tub of sufficient size, and cover with whiting. Be sure that the whiting gets in between the coils of the belt, and it will be only a short time before the whiting will absorb the oil from the leather. It will then only need to be wiped clean to be ready for further use.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

THE ability to put one's ideas on "paper" as it is called, is of more import than at first sight appears, and in passing let me say that without this means of developing and conveying ideas from one to another, we would not yet be far removed from the barbaric age in mechanical arts.

Purpose of Course.

You are not to run away with the idea that the purpose is to make a draftsman of you, and having that notion decide that as you are a machinist, this little instruction page need not be read. There will be, it is hoped, no limit to any position of responsibility or trust to which the instruction may lead, but to you particularly is attention directed.

The course will start right at the beginning so as to embrace all grades, and care will be taken to make the work interesting and not too heavy.

To those who have some experience along the lines of our subject, there will be found helpful hints and advice which will amply repay joining in the study.

Difficulties of Study.

Experience goes to show that the difficulty of those who would study in their leisure hours is not one of making a start, but rather a disinclination to keep it up after a short trial. Drawing and sketching is no exception in this respect.

To guard against this trouble I wish to point out a few of the causes why this state of things obtains, so that you may be on the alert when the symptoms appear.

Most people are enthusiastic over anything new, especially if it appeals to their personal interests. Drawing or the desire to be able to make one, appeals to 95 per cent. of mechanics, young and old, not only as a trade help, but also as an enjoyable pastime and a medium by which their imaginative ideas and dreams may assume concrete reality.

The enthusiasm born of this appeal to study, will, as in every other like circumstance, bring a reaction, which coming as it does at a critical time in a drawing instruction course, will require the exercise of a good deal of patient determination.

The impression formed by nine out of every ten who take up study is that the acquirement of knowlege is easy. The prospectus descriptions of drawing courses are largely to blame for this.

The acquirement of knowledge is easy in no sphere or profession, and what is more to the point, the acquirement of the habit of study is less easy still. Too little stress is laid on the necessity of this latter, in fact it is practically ignored.

You have been in the habit of going out every night in the week after your day's work, to have a little legitimate recreation and amusement. You have often thought of studying mechanical drawing, but on account of the want of a proper opportunity you have never done so.



Adjustable Drawing Table.

"Canadian Machinery," which you know, is a reliable journal and to which you have been subscribing for years, comes along in February and outlines just the course you have long looked for. It takes little time for you to decide what you will do, and to be sure you lay your leisure time at its feet,with a generous hand. "I'll give three nights a week to this course, and run in a fourth occasionally."

You make this resolution without counting the cost. You forget that habits have been acquired that are antagonistic to study, and that those necessary cannot be donned in a moment as neither can the others be doffed.

Taking up the course with a rush as it were ensures a reaction, and unfortunately an unhealthy one at that. You are endeavoring to bite off more than you can chew, and my advice is—act cautiously. Set apart one night per week or at most two, and allow yourself to gradually break off the old habits and acquire the new.

Don't believe that it is easy to learn to draw, and that it can be mastered in so many days or weeks. Think of your stage of proficiency in your own particular line, and just figure to yourself how long it has taken you to attain it. Don't imagine that drawing is any easier and you will assuredly succeed.

By looking the matter square in the face thus, you will not get despondent when the reaction sets in and you register your progress as slow. You will not be a "sticker," when you look disgustedly at your drawing board, wondering where all the dirt came from that is on your paper, or amazed at the unintentional contortions you have given to straight lines, the variety of thickness of them, the seeming impossibility of making a circle without showing half a dozen joints and at the number and size of holes your compass needle point has been guilty of.

These experiences are real, troubles which all who would aspire to the making of a simple intelligible drawing will meet, and to minimize and combat which the advice and effort of this instruction course will be directed on your behalf.

Operating Hints.

In order to keep the drawing paper as clean as possible, see that your hands and finger-nails are carefully washed and attended to before commencing work.

Have your coat off, the sleeves of it in contact with the drawing impart dirt more or less.

Never sharpen your pencils over your drawing or in fact, over the table.

Use a hard pencil, say a 3H, it will last longer, need sharpening less often and will assist in keeping the drawing clean.

Wipe the dust from all your apparatus carefully with a clean duster before starting work, and cover up all when you finish each time.

Keep the particles of ground rubber brushed off the sheet, as they being coated with lead from the erased lines, will, if allowed to remain, be crushed against the paper by the movements over them of the squares.

The last instruction on cleanliness is keep your hands as far as is possible from touching the paper. Most people's hands perspire to a lesser or greater extent, and their contact consequently is not conducive to a clean drawing.

*First of a series of an Instruction Course. A lesson will be given each month.

Boiler Design, Construction, Operation, Repairing and Inspection

By H. S. Jeffrey

The Various Points in Connection With Boiler Practice Will be Clearly Taken up in This Series. The First Article Deals With the Boiler Shell, Including Repairing, Factor of Safety, Hydrostatic Test and Number of Courses. The Series will be a Complete Text Book on the Subject of Boilers, and They Should be Preserved for Reference.

THE points considered by the designer in designing a boiler are most important. The boiler should be designed so as to permit proper circulation of the water; to permit the boiler to be easily inspected and cleaned; to prevent undue stresses upon

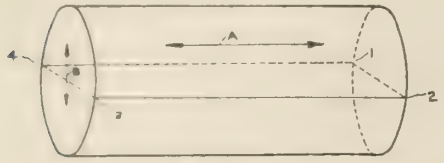


Fig. 1.—

some members and insufficient stresses upon other parts; to permit repairs to be quickly and cheaply made; and the proportion of parts to be such that the boiler will be a free steamer.

(2) Any boiler, whether used or not, will deteriorate. The deterioration is in form of wasting and the wearing out of the boiler, both internally and externally, such as pitting, corrosion, blisters and grooving, all of which means the repairing of the boiler, sooner or later. The essential part of repairing a boiler is to replace the defective part without reducing the strength of the boiler at that point any more than necessary, and, of course, applying the patch or new member in a manner to make the boiler as serviceable or as near as serviceable as formerly.

The foregoing can best be accomplished by the mechanic understanding the underlying principles of boiler design and construction. This being the age of specialists, many of those engaged in boilermaking are not well posted on the forces acting upon the boiler. The

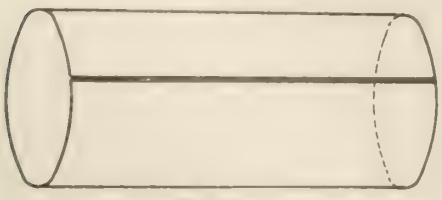


Fig. 2.—

riveter will understand fully about riveting; the flue man about the installation of flues, and others thoroughly acquainted with their respective branches, but the foregoing named specailists not being versed in boilermaking in all its branches are not in a position to advise as are all-around boiler makers with a technical education.

The repairing of a boiler is really an independent branch of boiler construction; it is re-construction. Boiler repairing could be more cheaply and better done if those making the repairs had knowledge of the forces acting upon the boiler, as well as the knowledge acquired by the operating engineer from constant observation of the boiler while in service, and especially the practicability of a patch or new member as applied.

The Boiler Shell.

(3) The boiler designer in deciding upon the diameter of the boiler shell must bear in mind the working pressure per square inch, the factor of safety, the efficiency of the longitudinal seam, the tensile strength of the plates and their thickness, and the type of boiler. There are also practical considerations which he must take into account, and which will be mentioned later.

A boiler shell or cylinder has two forces tending to rupture it. The arrow A, Fig. 1, indicates the force acting on the transverse plane, or cross-wise of the vessel. The arrow B indicates the force acting on the longitudinal plane, or lengthwise.

Though the steam pressure per square inch is the same throughout the boiler, the force acting on the transverse plane, generally called the girth plane, is about one-half the force acting on the longitudinal plane.

In Fig. 1, the vessel is shown seamless, and in order to explain fully the foregoing respective forces a concrete case of a seamless shell of 55,000 tensile strength, 66 inches in diameter by 14 feet in length, and of plate ⅜-inch in thickness will be given.

The force acting on the girth plane will be equal to the cross-sectional area multiplied by the working pressure per square inch. With a working pressure of 100 pounds per square inch the total force will be:

$66 \times 66 \times .7854 \times 100 = 342{,}100$ pounds.

The force resisting the foregoing is the strength of the solid plate in the transverse plane. The area of the plate is found by multiplying the circumference by the neutral diameter, which is equal to the inside diameter, plus one thickness of plate, or 66 inches plus ⅜ inch, making $66\frac{3}{8}$ inches.

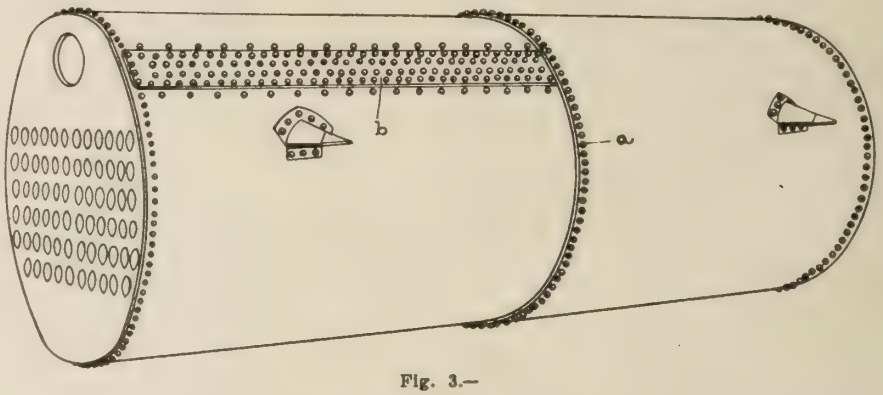


Fig. 3.—

Then the area of the plate of the girth plane upon which the force will act is:

$66\frac{3}{8} \times 3.1416 \times \frac{3}{8} = 78.2$ square inches.

The strength or the resisting force of the plate of the girth plane will then be:

$78.2 \times 55{,}000 = 4{,}301{,}000$ pounds.

The force acting on the longitudinal plane is equal to the area indicated by points 1, 2, 3 and 4, Fig. 1, times the working pressure in pounds. Since the vessel, Fig. 1, is 66 inches in diameter and 14 foot, or 168 inches in length and the working pressure is 100 pounds per square inch, the total force acting on the longitudinal plane will be:

$66 \times 168 \times 100 = 1{,}108{,}800$ pounds.

The resisting force of the plate of the longitudinal plane will be the length of the vessel from points 1 to 4, and points 2 to 3, Fig. 1, times the thickness of the wall. The length of the vessel having already been

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• First of a series of twelve articles on this subject.

stated to be 168 inches between points 1 to 4, the combined length from points 1 to 4, and points 2 to 3, is twice 168 inches, or 336 inches. The thickness of the wall of the vessel being ⅝-inch and the tensile strength of the plate being 55,000 pounds, then the resisting force is :

336 x ⅝ x 55,000 equals 6,930,000 lbs.

Since the longitudinal seamless plane has a resisting force of 6,930,000 pounds and the total force acting on said plane is 1,108,800 pounds, the ratio between the ultimate strength and the acting force is :

$$\frac{6{,}930{,}000}{1{,}108{,}800} \text{ equals } 6.25$$

The calculations in the foregoing paragraphs brought out that the force acting on the transverse plane amounted to 342,100 pounds, being resisted by a force of 4,301,000 pounds, therefore, the ratio between the ultimate strength and the working pressure is :

$$\frac{4{,}301{,}000}{342{,}100} \text{ equals } 12.5$$

Examination shows that the transverse load is approximately one-half the longitudinal load, and, accordingly the ratio between the ultimate strength and

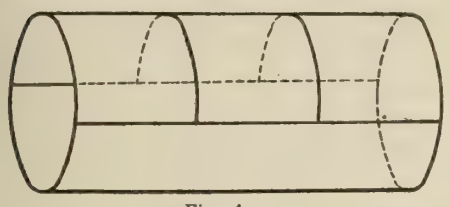


Fig. 4.—

the applied load on the transverse plane is about twice the ratio between the ultimate strength and the applied load on the longitudinal plane.

Longitudinal and Girth Seams le

(4) Prominent among the many problems which arise in designing a steam boiler is that of the arrangement of the courses and riveted joints. Very few vessels are made seamless, and, accordingly the rings or courses composing the vessel must be connected together in some manner.

This is accomplished by the installation of rivet holes in the plates and then securing the plates to one another by over-lapping and riveting, or by butting the plates and securing them by butt or welt straps riveted to the ends of the plates.

In Fig. 2 is shown a course of a boiler as it would appear when rolled approximately into shape, and no holes installed for the seams. The calculations for a seamless course brought out that the vessel was twice as strong through the transverse plane as the longitudinal plane, and for this reason the designer can make the girth seam a, Fig. 3, single-riveted, while the longitudinal seam must be made double-riveted, or triple-riveted, and with a high-pressure boiler the longitudinal seam is made a triple-riveted butt double-strapped joint with the outer row of rivets in single

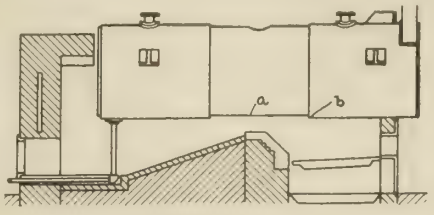


Fig. 5.—

shear, all as shown at the longitudinal seam b, Fig. 3.

The installation of the rivet holes does not make it possible to make the boiler at the longitudinal seam as strong at that point as the solid plate elsewhere in the longitudinal plane. The strength of the longitudinal joint will depend upon the type of riveted joint and the size and pitch of the rivets. The solid plate is to be considered as 100 per cent., and this is the case irrespective of the thickness of the plate, or its tensile strength.

Since the longitudinal seam is less than 100 per cent., and it is necessary when computing the working pressure to consider the strength or the efficiency of the longitudinal seam, the following formula, which is used by most authorities for ascertaining the allowable working pressure of a vessel, is given :

Where :

TS equals tensile strength of plate in pounds.
T equals thickness of plate in inches.
D equals diameter of boiler in inches.
F equals factor of safety.
A equals allowable working pressure per square inch.

$$\frac{TS \times T \times 2 \times E}{D \times F} \text{ equals } A$$

Factor of Safety

(5) It is not advisable to work a boiler or any other structure at or near its ultimate strength. There should be con-

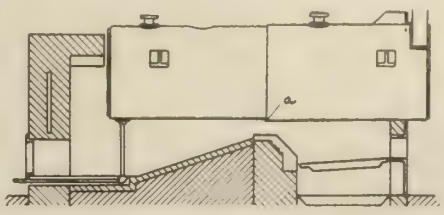


Fig. 6.—

siderable difference between the ultimate strength and the allowable working pressure. The ratio between the two is called the factor of safety, and in boiler construction the minimum factor of safety allowed by most authorities is 4.

The factor of safety cannot be set in an off-hand manner ; it must be decided by the circumstances of the case. Thus a boiler having all holes drilled in place and constructed with a double-strapped butt joint, will—and justly so—be allowed a lower factor of safety than a boiler of like size and design, but with the holes punched.

Many of the authorities have established the minimum factor of safety at 4, and then add to it certain amounts in accordance with the type of riveted joint and the grade of workmanship. Such rules and regulations encourage good design and workmanship.

A high factor of safety does not indicate that the boiler is better constructed than a like boiler with a lower factor of safety. The minimum factor of safety should not be less than 4—and a boiler properly designed and constructed with a factor of safety of 4 is a safer boiler than one poorly designed and constructed with a factor of safety of 6.

The Hydrostatic Test.

(6) Merely because a steam boiler withstands a given hydrostatic or cold water test, it is no sign that the boiler is safe. The test itself, if improperly applied—that is, an excessive pressure applied, will injure the boiler. The elastic limit of the steel, which is about 50 per cent. of the ultimate strength of the plate, must be taken into consideration.

The elastic limit means the point where the applied load begins to produce a permanent elongation. Up to that point the metal will yield slightly, but when the load is removed the metal will return to its original length. It is never safe to place a load on any structure beyond this point. A boiler constructed for a working pressure of 100 pounds steam pressure per square inch, factor of safety of 5, would burst at approximately 500 pounds pressure per square inch, but the danger point would be reached at approximately 250 pounds (or the elastic limit) if the square of the section of plate in the longitudinal seam is equal to the shearing strength of the rivets.

This is assuming that the efficiency of the riveted joint is determined by the plate, maximum net section of plate, and the efficiency of the rivets exceeds the latter to some extent. With a factor of safety of 4, the boiler will show signs of distress at 200 pounds pressure, for as soon as the elastic limit of the plate is reached the plate begins to reduce in area, consequently a loss of strength ensues which cannot be regained.

It must not be assumed that a boiler constructed for 100 pounds pressure,

factor of safety of 4, will be able to sustain a hydrostatic pressure of 200 pounds per square inch without serious and permanent injury to the plates. The hydrostatic test should at all times be less than the elastic limit, and a cold water test of one and one half times the allowable steam working pressure is ample.

Number of Courses in a Boiler Shell.

(7) In the earlier days the designer was forced to give consideration to the size of plates obtainable. With the introduction of larger and heavier machinery in the rolling mills, plates are now made of greater thickness and length and width than formerly, and, accordingly the number of sections or courses now composing a steam boiler are fewer than before.

The steam pressure per square inch of steam boiler has increased gradually in late years, and this with the changes in the plates has caused the whole field of boiler designing and boiler constructing to undergo marked changes within the past fifteen years.

The number of courses to be used in a horizontal tubular boiler is a question upon which boiler designers are not all of the same opinion. Some have advocated making large tubular boilers of one course. This is the practice for the shells of small size tanks and air drums and like structures, and has given satisfactory results, but the one course large size boiler has been anything but a success, and for reasons which will be hereinafter given.

Others have advocated constructing horizontal tubular boilers with a long bottom course and several upper courses as shown in Fig. 4. There is no advantage in this form of construction in regards to the costs of manufacture. This plan of construction is used principally with large tanks, such as used by railroads for transporting oil. Vessels of this design have given satisfaction in the foregoing field, but what few boilers of this design, where the shell is in contact with the flames and hot gases, have been a source of trouble almost from the day they were installed.

The majority of boiler manufacturers are now constructing tubular boilers with either two or three courses. The tendency is to favor the two-course boiler. This is due to the fact that a two-course tubular boiler can be constructed somewhat cheaper than a three-course boiler. The boiler manufacturer in order to meet the demands for boilers at low figures, naturally, designs and constructs the type which has the lowest first costs.

While the purchaser desires to purchase everything as cheaply as possible, which fact has been deeply impressed upon the mind of the manufacturers, the purchaser should take into consideration the whole field and not merely first costs.

The three-course tubular boiler as shown in Fig. 5, is favored as the girth seams a and b stiffen the shell sheet, while the stiffening of a two-course boiler as shown in Fig. 6, is only one-half that of the three-course boiler. Of the above respective types of boilers, experience has shown that a two-course boiler with long longitudinal seams is not as satisfactory as a three-course boiler with short longitudinal seam, and as a general rule a three course boiler is more durable than a two-course boiler.

There is also another point in favor of the three-course boiler. The girth seam of a three-course boiler is well away from the bridge wall, the same being indicated in Fig. 5, while the girth seam of a two-course boiler is directly over the bridge wall, the same being indicated in Fig. 6. With a three-course boiler the impinging flame strikes the shell sheet at about the point a, Fig. 5, while with a two-course boiler the impinging flame strikes the shell sheet at or near the girth seam a, Fig. 6.

While it is true that the girth seam b of a three-course boiler is directly over the furnace—and this is not the case with a two-course boiler—the girth seam b, Fig. 5, does not come in contact with the impinging flame as does the girth seam a, Fig. 6.

The foregoing considerations are uppermost in the minds of boiler designers when designing tubular boilers. In addition thereto comes the question of repairs. It has been found that a two-course boiler is more liable to bag from scale, mud and grease than a three-course boiler, and further when trouble of this character arises, a three-course boiler tends to prevent the bag from spreading over a great distance, and accordingly the repairing is usually less with a three-course boiler than a two-course boiler.

Machining a Flexible Joint for the Toronto Intake Pipe

The Variation in Levels, Where the Intake Pipe Extension is Being Laid at Toronto, Necessitates the Changing of Direction by Using Ball and Socket Joints. The Machining of These Large, Flexible Joints is an Interesting Problem Which was Solved by the Canada Foundry, Toronto.

THE intake for Toronto water supply extends out into Lake Ontario. For some time trouble has arisen from sand and brushwood collecting around the mouth of the intake. The Toronto Board of Control and Council were impressed with the idea that purer water could be obtained farther out in the lake and that the above troubles could be eliminated.

City Engineer Rust and Assistant Engineer Fellows were instructed to extend the intake 500 feet. The extension had to be made in deep water and the pipe laid on a varying level of lake bed. The extension has therefore created a number of problems to be solved.

One of these problems was to make provision for the change in direction of the pipe due to the difference in levels. For this purpose it was decided to use two ball and socket joints. The ball and joint must fit perfectly, otherwise a leak would result. The machining of these joints was therefore a very fine piece of work, necessitating absolute accuracy. Two joints were made to fit in between three sections of pipe, each 168 feet long, 72 inches diameter. The plate used was 5-8 inches thick, channel riveted to cast steel flanges and turned to suit the radius of the bearing. Fig. 1 shows the finished ball joint.

The contract for the flexible joints was given to the Canada Foundry Co., Toronto, and Mr. Loach, the superintendent devised the plan of machining the work. This taxed the machinery to a certain extent. It was finally accomplished on a large locomotive wheel lathe built by the John Bertram & Sons Co., Dundas.

Operations.

The machine operations on the ball joint were as follows:

(1) The casting which is 7 ft. 3 in. outside diameter finished, was put on a 10 ft. boring mill, bored and faced on outside and given a roughing cut to remove uneven metal.

(2) It was sent to the boiler shop and riveted onto piping with flange. This piping was short length and steel flange

made it easy to hold the casting on the face plate of the wheel lathe.

(3) The rigging was composed of a ball-bearing turntable ordinarily used for heavy drill press work, fastened in the exact centre of the lathe underneath the casting; a bar connected the turntable with the tool post which was removed from original fittings and placed on a surface plate. A screw feed attachment for moving tool post on a perfect radius resulted in an excellent job and an exact circular surface.

Mechanism Explained.

The tool post rested on the surface plate A, Fig. 2, and was connected to a ball bearing centre by the rod J, thus making a solid connection between the two. The tool post was fastened to a plate with a lug E. The ratchet D was fastened to the screw B. By operating the ratchet, the tool post resting on the shoes F, was drawn towards the lug C which was permanently fixed to the surface plate.

The casting has a steel pipe fastened to it. This pipe has a flange by which it was bolted in the lathe as shown at H. On account of the weight of the ball joint, it was braced from the face plate shown on the right of the illustration. Four braces were used, being fastened solidly by means of turnbuckles as shown at H. This arrangement prevented any moving of the work during the machining operations. The result was a perfect ball joint.

PERSONAL.

Geo. D. Leacock has been appointed travelling representative for the Packard Electric Co. for the territory between Kingston and the Soo. His headquarters will be in Toronto.

* * *

Laurence T. Walls, of the Dominion Wire Mfg. Co., Montreal, has accepted a position in the Winnipeg office of the Steel Co. of Canada, as assistant to Mr. Hanna, manager of the Northwest sales branch of the Steel Co.

* * *

J. T. Brower, manager and engineer of the Structural Steel Co., Longue Point, will become general manager of the National Bridge Co., of Montreal. He will take charge of the National Bridge Co. on March 1.

* * *

Thos. Moore has been appointed manager of the Belleville Rolling Mills, which is a branch of the Steel Co. of Canada. Mr. Moore was connected with this firm shortly after it started in business, but resigned to take position of salesman with the Canada Screw Co., Hamilton.

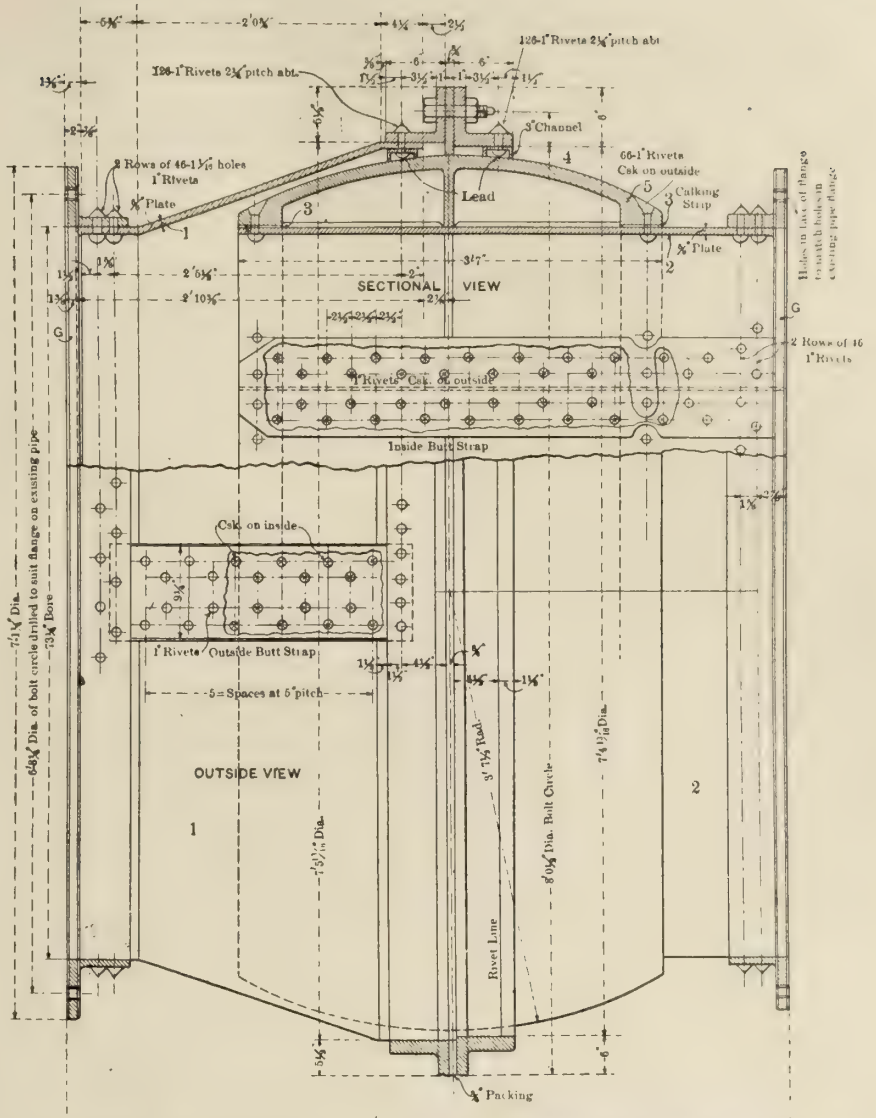


Fig. 1—Flexible Joint, Designed by the To ronto Waterworks Department for the Intake Extension.

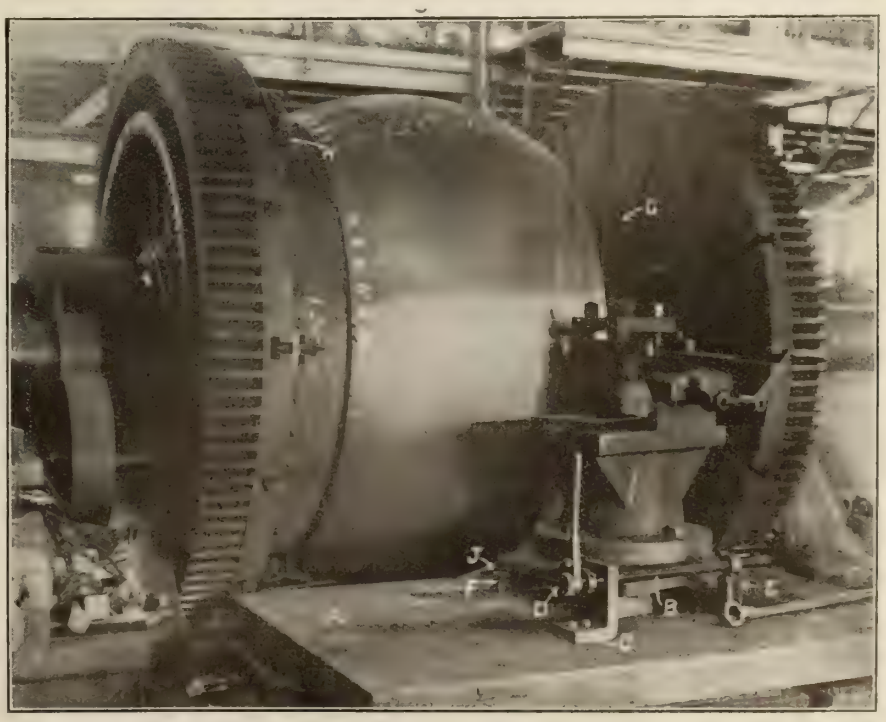


Fig. 2 A Ball Joint made at the Canada Foundry, Toronto, for the Toronto Water Supply Intake.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

TURNING DIE SECTIONS OF LARGE RADII.

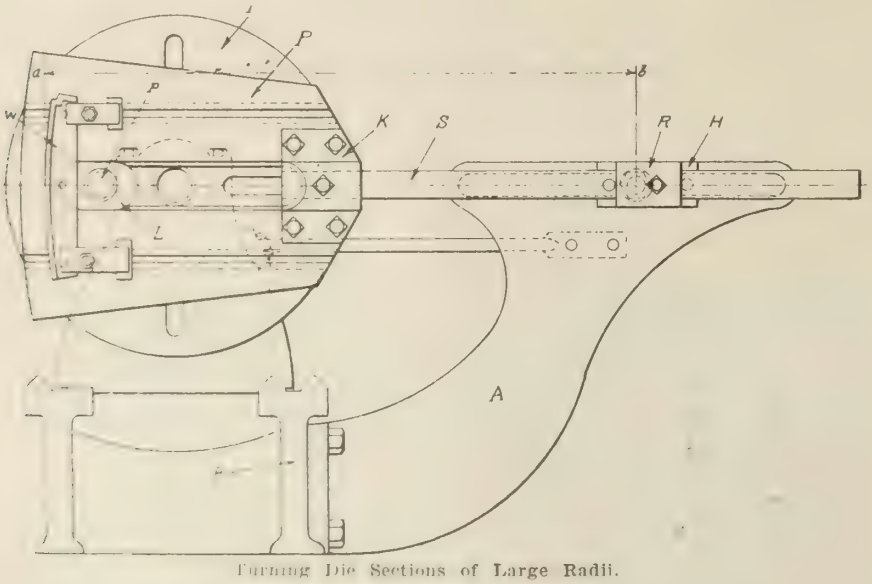
By J. H. Rodgers.

The accompanying sketch shows an attachment placed on a gap lathe for the purpose of turning the portion of a circle of large radius, as found on a blanking die for pail or tub sections, and other similar work, within the range of the attachment.

The large bracket A is secured to the bed of the lathe B in such a position that the back of the plate P rides on the surface of the face plate F.

The plate P is kept in contact with the face plate F by the pin P and the block L. At the rear of the plate P is secured a bracket K, which carries one end of the shaft S, the other end passing through the swivel block R, which is free to turn in the piece H. H can be secured in the slot as shown to suit the radius being turned as a—b.

The pin P is secured to the face plate in a position that gives the desired travel to the work W, which is fastened to the plate P.



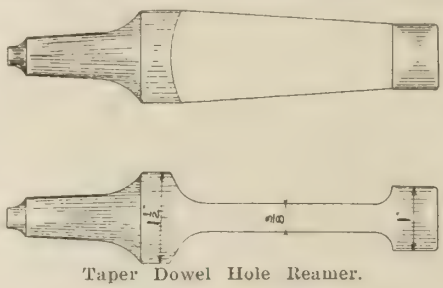
Turning Die Sections of Large Radii.

As the lathe spindle revolves it gives an up and down motion to the work, similar to the action of a shaper, only the tool is stationary, while the work is in motion.

TAPER DOWEL HOLE REAMER.

By L. R. Brown.

The sketch and description refers to a tool used in the C.P.R. Angus shops, Montreal, for reaming taper dowel plug holes in locomotive driving box crown brasses. It is cheaper to make, cuts cleaner, quicker, and gives better results than the ordinary fluted reamer; does not bind, and can be sharpened in a few minutes on an ordinary flat emery wheel, and saves toolroom time by doing away with the necessity of having an experienced toolmaker grind it.

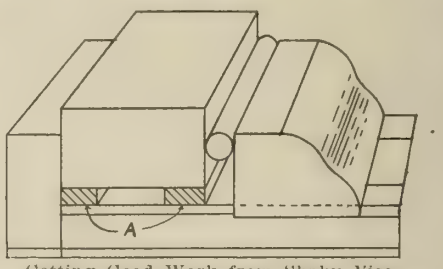

Taper Dowel Hole Reamer.

The tool is made from 1½ inch round stock; the shank being turned to fit machine spindle, the body turned to required taper and milled out to ⅜-in. thickness, leaving a 1-in. diameter turned pilot end, to steady the tool in operation, and ensure a true hole. The cutting edges are filed to give the necessary cutting clearance, and these only should be ground.

GETTING GOOD WORK FROM "SHAKY" VISE.

By G. B. Marquette.

Most of us have experienced trouble in getting a block or key which is to be held between the jaws of the vise to lay flat on the parallel bars A, just as the movable jaw tightens on the job, the slackness in the jaw lifts the piece of work. Time after time the vise is slackened and tightened again. It would not be hammered down. Time is being wasted for the machine stands idle. Take a piece of ⅜-in. rod, insert between the movable jaw of the vise and the work and tighten. Instead of the slackness in the jaw lifting our work, the piece of ⅜-in. round will accommodate itself to the movement of the jaw and roll slightly, leaving our piece of work perfectly flat, and upon the top face being machined will be found to be perfectly parallel.



Getting Good Work from Shaky Vise.

TO SAW SHEET IRON OR PIPE.

By G. B. Marquette.

In the machine shop we frequently have to make a template of sheet iron, and in order that we may not distort the material we are obliged to use a hack saw. Immediately we attempt to use it, we are in trouble, for the thin sheet iron just drops between two of the teeth and stops there. To get over the difficulty simply reverse the saw blade in the frame and proceed in the usual way. It will neither catch or break, and cuts just as well.

RUSSELL AUTOMOBILE BRAKE.

The construction of an automobile brake is not very generally understood. The ones shown in Fig. 1 and used on the Russell cars, manufactured by the Canada Cycle & Motor Co., Toronto, will therefore be of interest.

In the end view, the moving element is shown hatched. In an automobile brake there are two main considerations, namely, lightness and positiveness of action, particularly the latter feature, as such a brake must never fail to work when required. For this reason, each brake has two clutches, the ordinary, and the emergency.

The outer brake shoe is part of the "ordinary" equipment. It is put in operation by moving to the right the lever 6649 (shown to the extreme right of the cut.) This tends to bring closer together pins 3012 and 1188, tightening

the brake on the outside of the moving shell. When the brake is released, spring 5918 separates the two elements of the brake shoe, which are hinged on the far side. As this brake is in constant use, the friction face wears, loosening the brake on the moving element, necessitating a further movement of the brake lever to tighten the brake. For that reason it is made adjustable for wear by threading the bolt connecting the two halves of the brake, as shown. Customarily in most brakes, a nut and jam nut are employed, requiring a journey under the car each time adjustment is needed. The Russell car uses a simple contrivance to overcome this, using the lock nut shown at 5921, and more clearly in Fig. 2. The connecting bolt passes through a hole in pin 3012, and the lock nut, which has its face rounded out, conforms to this surface, and is positively held in the one position by the spring holding it there. This permits of only half turn adjustment, which meets requirements.

For emergency purposes, there is an inner clutch, as shown, and which is of a much more positive nature. It consists of a toggle joint operated by lever 6321 (shown dotted inside view.) The shoving to the right of link 797, creates a tremendous outward pressure of the brake on the moving element, stopping it almost instantly if applied with sufficient force. It is also adjustable as shown by a small turnbuckle threaded right and left hand. A spring 6585, holds the shoes out of position when

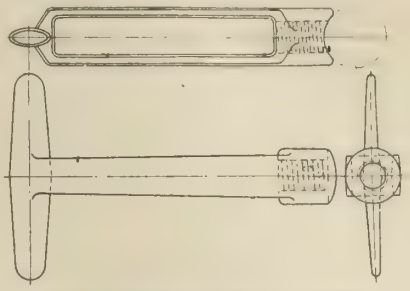


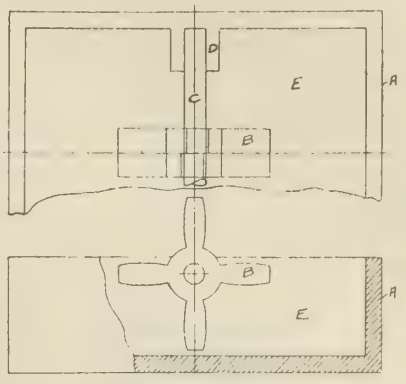
Fig. 2—External Brake Adjuster.

not required. It is not adjustable, as this is unnecessary, the brake being only put in commission in cases of emergency.

WORM GEAR OILER.

One of the most difficult pieces to keep properly lubricated, is the worm gear on a vertical shaft, for there is nothing to retain the oil or grease like there is when it is placed horizontally. This has been the experience of Wm. Kennedy & Sons, Owen Sound, who have improvised the simply device shown in the accompanying sketch, to overcome lubrication difficulties of worm gears on vertical shafts. The fixture consists of a shell A in which are paddles B, on shaft C, which is supported in cast bearings, projecting from shell A. The box A is placed directly beneath the worm to be lubricated, in such a way that the teeth of B, mesh with the worm teeth. Of course, B must be made specially for different worm pitches. The space E is filled with a semi-fluid grease, which is lifted up into contact with the worm as each tooth of B rises. The grease must be semi-fluid to insure the space around B being always filled.

There are two wheels B, one placed slightly behind the other, as shown in the plan view, thus giving pitch to the oil wheels, to match the worm. The whole device, while very simple and crude, meets the requirements extremely



Worm Gear Oiler.

well. Gears examined after long use, showed practically no wear, whereas, before using this method, the wear was quite considerable.

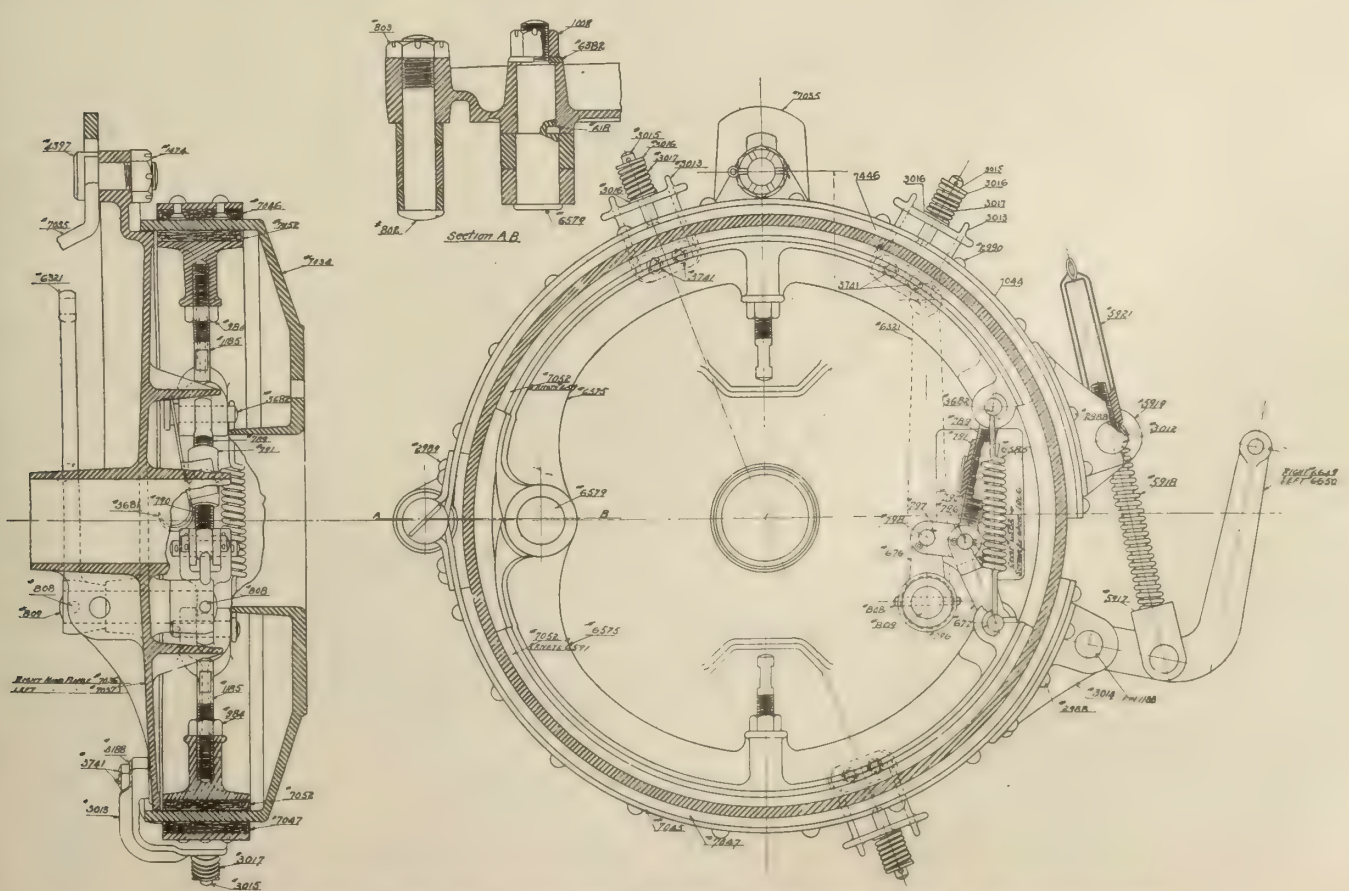


Fig. 1—An Effective Automatic Brake used on Russell Cars, Canada Cycle & Motor Co., Toronto.

SHOP KINKS.

By M. E. D

Soft-soldering is not considered a very mechanical way of fastening machine parts, but it sometimes helps one out of a difficulty in a surprising manner. Over a year ago the writer had the job of repairing a lathe on which the main driving gear was loose on the spindle. The spindle was hollow, and so thin that it did not furnish a good support for the key. The gear, spindle, keyseat, and key were cleaned and carefully tinned. They were then heated hot enough to melt the solder, and were assembled. The lathe has been in hard service ever since, and the gear is still perfectly tight.

A very satisfactory extension drill may be had by taking a piece of iron or brass pipe, whose internal diameter equals that of the hole to be drilled, and with a crosspeen hammer make two dents directly opposite each other and about 1½ inches from one end. Into this pipe drive the twist drill, after having ground the end flat. This is a very good way of driving taps also.

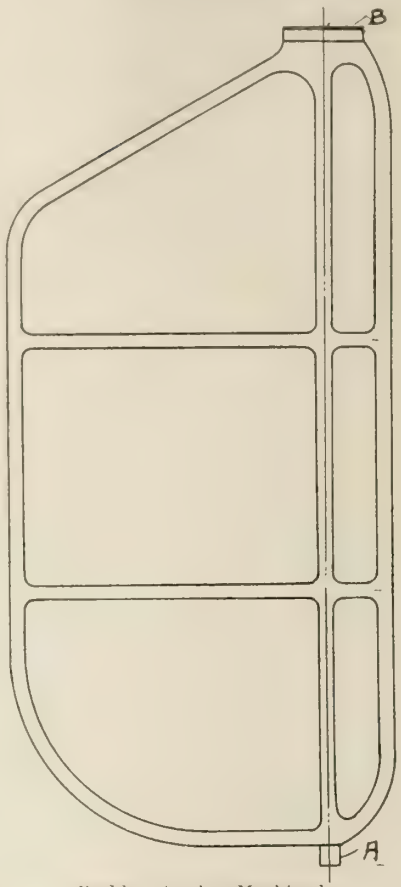
In many small shops the screw machine and other tools are finish-ground on copper laps. These laps are about 10 inches in diameter by about ½ inch thick, and are mounted on the same spindle as the emery wheel. The lap is easily charged in the usual way by using a hardened steel roller and rolling the abrasive into it. Tools finish-sharpened in this way will do much better work, and will last much longer.

To drill a large hole clean from the start without jumping or chattering in the least, take a small piece of old rag or waste about the size of the end of the drill; place it under the point of the drill, and then drill through the rag or waste. This idea may be used to fa great advantage in countersinking work which requires a clean finish.

MACHINING RUDDER STEM.

The accompanying sketch is the steel frame of a large rudder being made for a boat 580 feet long, at the works of the Collingwood Shipbuilding Co., Collingwood, Ont. It is about 21 feet long, and nearly 10 feet wide, and when completed will be covered on both sides with boiler plate.

The machining of the bottom tip A of the rudder presented a problem, for the largest lathe in the shop had only an 18 ft. bed, and 18-in. swing, while a swing of at least 8 feet was necessary if the article was to be turned in the usual manner. The tip, itself, is only 5½ inches diameter by 5½ inches long. The difficulty was overcome as follows: The rudder was jacked up on its flat side on the carriage of the lathe. A cross tool was secured to the face plate, and after adjusting, the carriage feed was put on, feeding the work up onto it,



Rudder to be Machined.

thereby doing the work. A very neat and accurate job was produced in this way. The other end B was completed on the planer.

FERRULE ROLLER.

Chas. Barber & Sons, Meaford, Ont., have a neat little device, which they improvised recently to make the ferrules shown at A in the accompanying sketch. Large numbers of these are required as spacers in the guard racks made for their turbine installations.

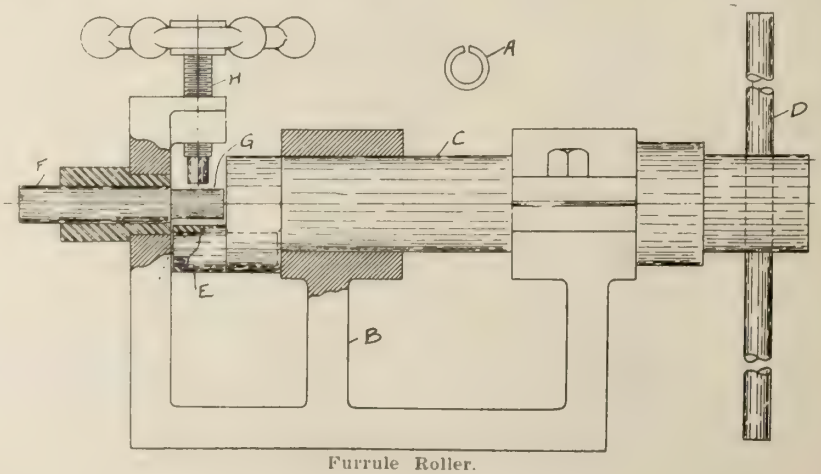
The device consists of a body, B as shown. The shaft C, has a long handle D on the end for twisting, while the other end is formed as a crank with the desired throw. The crank pin has a hardened steel roller E on it. In the same line as the shaft is pin F, the inner end G being of the desired size of the inside of the ferrule. H is a clamping screw.

The stock, 1"x⅛" band iron, is cut the desired length, and one end of the piece placed between clamp H and pin G, after the shaft C has been turned to its highest position, the roller being thus over the ferrule blank. After clamping H, shaft C is revolved, the roller E bending the stock to the shape of the pin G. Pin F can then be withdrawn, this action removing the ferrule, leaving ready for the next. A boy can produce over a thousand in a day.

INSERTED CUTTER TAPS AND DIES

The uses to which high-speed steel has been put are numerous, in the metal working industries especially. Following the trend of development, Robt. Dryden, toolmaker for Sheldons' Ltd., Galt, has gotten out for use in the works, the tap and die shown in Figs. 1 and 2 respectively, wherein a minimum of high-speed steel has been made to do maximum duty.

The tap shown in Fig. 1 consists essentially of a machinery steel body A, on which the collar D is turned, and which has the four longtitudinal flutes as shown, the flute passing down through collar D as well as into the main part of the body. The split collar C is threaded corresponding to the thread of the tap, and can be tightened down by the side set screws. This collar, being faced off squarely, bears against the collar D on the body, and holds the chasers in alignment, and prevents cross-threads. Heavy working does not tend to put them out of position, but the reverse. The chasers are made in a solid arbor, into slots in which, they are tapped, eight at a time. It will be noticed that the slots in body A are so made that the cutting face is perpendicular. In order to back off the chasers, the grooves in the cutting arbor, are



Furrule Roller.

off-set slightly, so that the back is cut deeper than the front, so no backing-off attachment to the lathe is necessary.

Fig. 2 shows the inserted cutter prin-

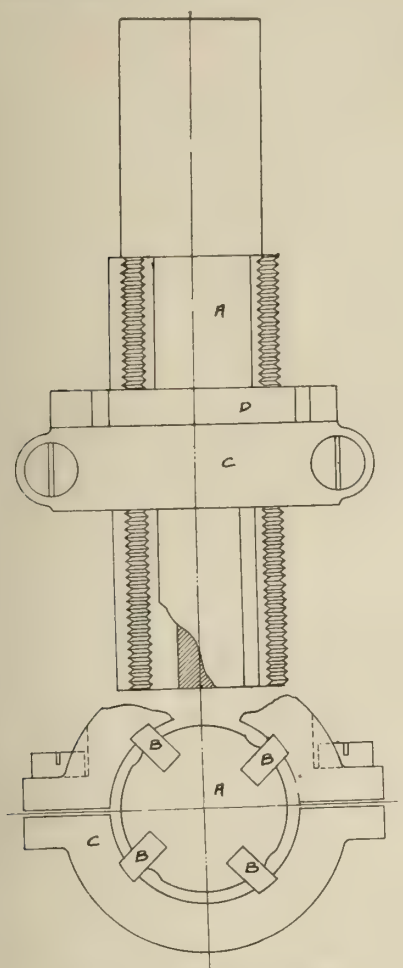


Fig. 1—Inserted Cutter Tap.

ciple applied to a die used for threading pipe plugs, etc. As before, the body A is soft steel, with high-speed steel

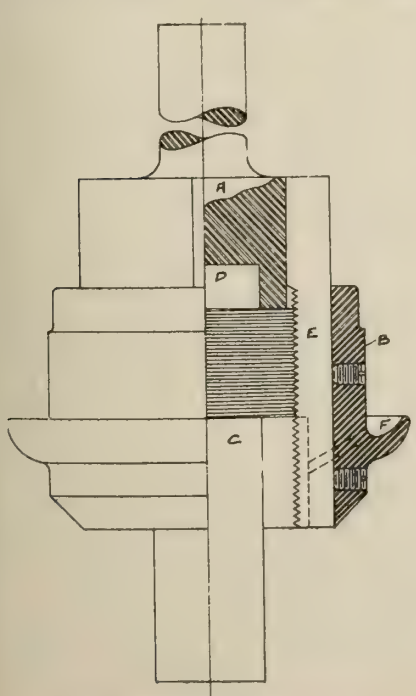


Fig. 2 Inserted Cutter Die.

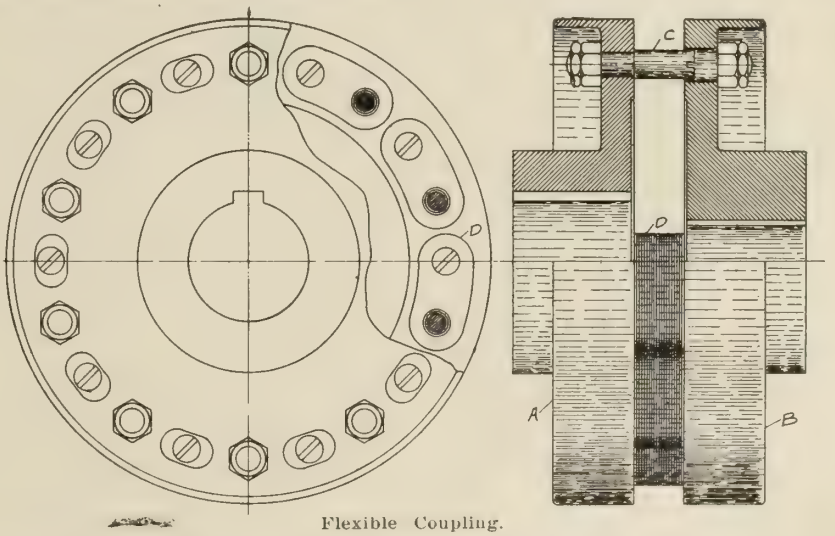
chasers E, held in position by collar B. To keep the alignment, a centre pin C is threaded, and has a tip D which centrally locates both chasers E, and pin C. Set screws in collar B adjust the chasers in, as desired.

One of the noticeable features is the method of lubrication. An annular channel F in collar B has several holes leading down from it to the face of the chasers, feeding the cutting fluid down on the cutting edges at all times.

The really valuable feature about both tap and die, is the longevity, for both will last an indefinite period. In all thread cutting tools, it is at the tip that the heaviest cutting occurs, causing the greatest wear at that point. In these inserted chaser tools, the tips can be ground off, and the chasers lowered a tooth, making them as good as new.

FLEXIBLE COUPLING.

The accompanying sketch is of a flexible coupling used by the Canada Gas Power and Producer Co., Barrie, Ont.,



Flexible Coupling.

for direct-connecting their gas engines to generators.

The coupling A is attached directly to the crank shaft, while B is on the generator shaft. It will be noticed that the arrangement consists of these two couplings, with pins, such as that shown at C, projecting inward, alternately from each one. For example, pin C, projects from A, and is free in a larger elongated hole in B, so that B may move up or down, etc., within limits, without fouling A. The next pin projects from B into A, and so on. Between these pins are leather links D, through which A drives B. This has proved to be an excellent coupling.

HOLDING LEATHER ON IRON PULLEYS.

By R. F. Williams.

First soak twelve ounces of good glue in cold water. Put four ounces of boiled oil and four ounces of turpentine into the glue pot, and in this dissolve three ounces of resin. When the resin is dissolved, add the glue. The resin and glue should be well stirred while dissolving.

Before applying the leather cover to a pulley have it warm and dry, and scrape off all matter that may have accumulated on its face. Then with a swab, apply muriatic acid (full strength) to all parts of the face of the pulley. When dry, wipe gently with waste. Cut leather lengthwise of hide, and a little wider than the face of the pulley. Have the cement melted in the glue pot, apply it across the face of the pulley, with a brush, for about six or eight inches, lay on the end of leather and rub it down hard with the corner of a piece of wood. Fold back the leather and continue to apply cement until the pulley is covered. Two thicknesses of leather are used. Make the first thickness a butt joint, and the last a scarf or lap joint of about three or four inches long. Make the laps on the driven pulleys the way they should run, and on the drivers the opposite way. Pulleys should be cleaned by holding a piece of coarse sand paper against them.

HACK-SAW ATTACHMENT FOR LATHES.

By H. D. Chapman.

The accompanying drawing shows the way in which a hack-saw can be attached to a lathe. This will be found very handy about a small shop, and is inexpensive and simple in its construction. The device is so constructed that it can be easily put on and taken off the lathe.

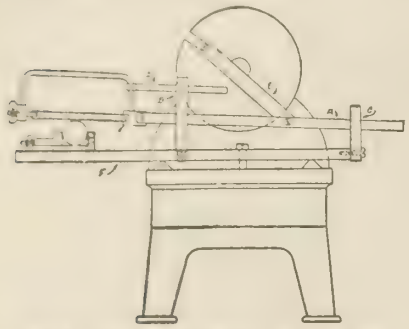
The saw and its parts are mounted on a 1-inch thick by 8-inch wide cast iron slab; this makes the device easy to use on any lathe. The device consists of slide bar A, and two supports on each end, B and C, which are to guide the bar

A, the bar D is to brace the saw frame and to keep it from turning.

The slide is a flat piece of machine steel 5-16 inch thick and 2 inches wide; the length is about 4 feet, or to suit the stroke. A hole is drilled in the slide bar A for a 5-16 inch bolt. This is to hold the connecting rod E.

The supports B and C are made of 1-inch square stock. The support B has an end turned and threaded to suit a ½-inch tapped hole which is in the cast iron base F. The support C is bolted to the outer end of base, as shown. Each support has a 5-16 in. slot cut through the center, so as to allow a neat sliding fit to slide bar A.

The guide D is made of 5-16-inch by 1-inch machine steel. One end of guide



Hack Saw Attachment for Lathes.

is bolted to saw frame, allowing the other end to slide through support B, thus preventing the saw from having any wabble.

The connecting rod E is a strip of 5-16 in. flat steel about 2 inches wide and of a length to suit the saw frame. The connecting rod is also bolted to the face plate of the lathe, as shown in the cut, and can be adjusted in the slot of the face plate; this adjustment will accommodate the length of the saw.

The saw frame is made of machine steel, and the saw is made tight in the frame by means of a thumb-screw, as shown at the outer end of the frame.

An ordinary quelline vise is clamped to the base plate; this holds the stock while cutting off. This back-saw fixture is clamped to the shears of the lathe, as shown, and is held in position with a [illegible] bolt.—Scientific American.

Correspondence

Comments on articles appearing in Canadian Machinery will be cheerfully welcomed and letters containing useful ideas will be paid for.

Information regarding manufacturers of various lines, with their addresses will be supplied either through these columns or by letter, on request. Address letters to Canadian Machinery, 143-149 University Ave., Toronto.—Editor.

Tapping Hole Straight.

One of the questions asked a C.P.R. apprentice on a recent examination was: How can you tell whether a tap is going in straight or not, if the hole being tapped passed through the centre of a sphere? Perhaps readers of Canadian Machinery would have some ideas.—Reader.

Bolt Hole Facing Tool.

In the article "A Day's Ramble Through the M.C.R. Shops at St. Thomas," December issue, 1910, a description is given on page 39 of a Bolt Hole Facing Tool shown in the attached drawing, Fig. 1. The article states, "In

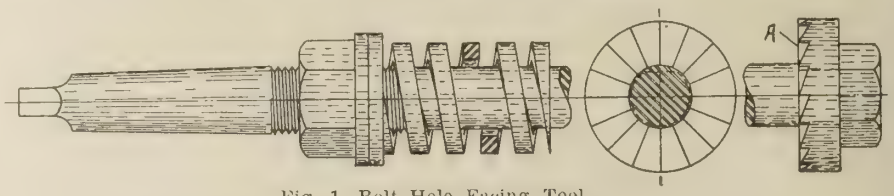


Fig. 1—Bolt Hole Facing Tool.

place of being keyed in the usual manner, the centre hole is bored flat on one side, and the bar itself flattened to correspond. Will you kindly explain how the cutter is "bored flat?"—Novice.

The hole in the cutter blank which is made of high speed steel, is first drilled with a 1 in. drill. The blank is then

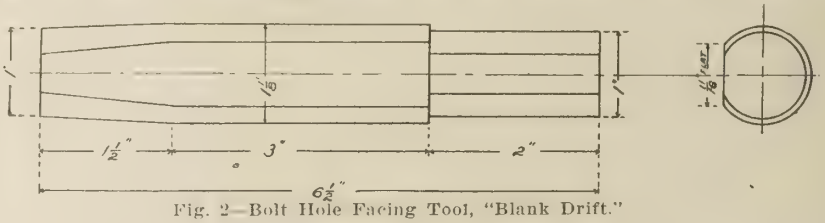


Fig. 2—Bolt Hole Facing Tool, "Blank Drift."

heated and the drift shown in Fig. 2 is driven through, thus leaving a flat side in the hole. The blank is then put on a mandrel and machined. This will no doubt satisfactorily explain the meaning intended by the words "bored flat."

WINNIPEG RAILWAY CLUB.

At a recent meeting of the Western Canada Railway Club, Winnipeg, S. A. Gidlow, general secretary of St. John Ambulance Association, C.P.R., Montreal, read a paper on "First Aid to the Injured." There were several practical demonstrations of ways of rendering "first and." These, which were superintended by J. T. Warde, G. D. Lockhart and Dr. Moorehead, showed methods of immediate treatment of: a compound fracture of the thigh; a broken collar-bone and fracture of the forearm, such as would likely follow a street car accident; and hemorrhage in different parts of the body. Also there was illustrated the right way to lift and carry a wounded man, and the Schaffer, Labord and Sylvester methods of inducing respiration.

Mr. Gidlow, in his lecture, pointed out in the commencement that a life might often be saved by the possession of a little intelligent, first-aid knowledge on the part of the by-stander. Illustrating his argument by little narratives of real accidents, Mr. Gidlow proceeded:

"The case of possible death by drowning demands special attention. Ignorant and careless handling of the supposed victim by drowning has often unwittingly completed the work of suffocation by immersion, and one can realize what this means in this country, where an average of seven hundred drowning accidents occur every year.

"First aid is a branch of work entirely different from that of the surgeon. It is special, and differs from the special training which every student receives. The medical student is taught to use all the best and most approved methods, while the first aid student is taught to use whatever is nearest to hand in the most scientific way possible. He must make a bandage out of a neck-tie or a handkerchief. He must improvise a tourniquet from a belt or a brace; for splints he must utilize a stick, a rifle, an umbrella or folded newspapers, and construct a stretcher out of a couple of broom handles and coats."

Mr. Gidlow explained the course of instruction in detail. The first three lectures dealt respectively with the bones, circulation and nervous system; and the fourth and fifth with methods of rendering first aid and of carrying the injured. As soon as the lectures were finished, the men were taken in hand by one of the company's ambulance instructors, and taught the practical work. Test questions were put to the classes before they were allowed to go up for examination.

In conclusion Mr. Gidlow told of the classes organized along the different divisions of the C.P.R., totalling 51 classes and consisting of 1,607 men.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

HEAVY DUTY ENGINE LATHE.

The accompanying illustration shows a general view and details of a 21 inch heavy-duty engine lathe recently placed on the market. This is one size of a line of lathes of the same type, including 17, 19, 21, 25, 27, 30 and 33 inch. lathes. The principle on which these machines have been designed has been to furnish a tool capable of taking a given cut and removing a given number of cubic inches of metal per minute. The 21 inch lathe shown is capable of taking a cut $^1_4$ inch. deep with a feed of 1-6 inch at a cutting speed of 65 feet per minute, in 50-point carbon steel. This is equal to removing 32 cubic inches of metal per minute.

The head stock is of the LeBlond improved drop brace pattern and is securely fastened to the bed with bolts of large size. The three-step cone pulley in conjunction with the double friction back gears and a two-speed counter shaft, provide in all, eighteen changes of spindle speeds, covering a range carefully selected for the purpose of the machine. The spindle is hollow and made of high carbon hammered steel, and is hardened and ground at the front and rear journals. These latter are carried in cast iron boxes scraped to a good bearing fit. This type of bearing the builders consider preferable because it does not require intricate oiling devices with continual attention on part of the operator; yet the lubrication is well taken care of. The bearing standards are cored out to form large oil chambers which are filled from the front of the lathe; from these the oil is fed to the bearings by means of felt pads. This construction eliminates all possibility of grit and dirt entering the bearings, and reduces the attention required to filling the oil receptacle once a week.

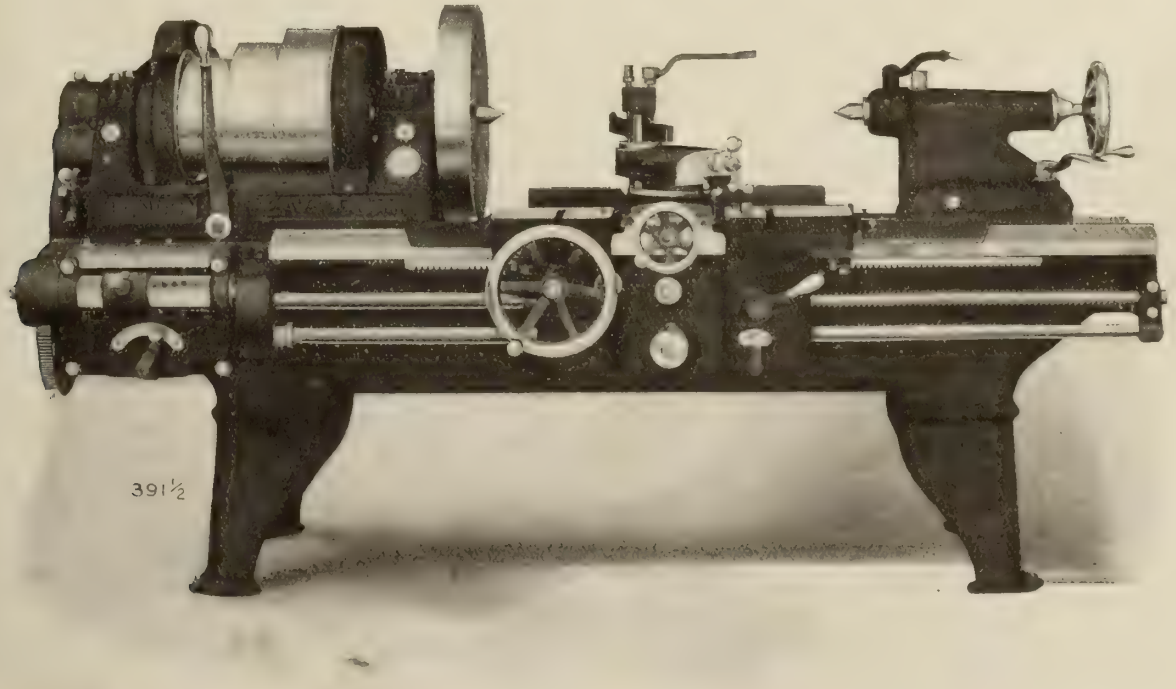
The tail stock is of massive design with a bearing of ample length on the bed. The tail-spindle barrel is designed in such a manner as to give the maximum length of bearing combined with long travel. Screws are provided for setting over the tail-stock for taper work, the base being graduated so that this setting can be easily accomplished.

A new departure has been followed in the design af the bed. The tail-stock slides on a V of the usual proportions on the rear way, and on a flat surface in the front. The carriage travels on a flat surface in the back, as shown, and is held down in the back by a flat gib. The front of the carriage slides on a guide of different shape from that usually found in engine lathes. This guide, as shown, is V shaped, but is machined at an angle of 15 degrees on the front side, and 70 degrees on the back, making the total included angle 95 degrees.

The carriage is held in alignment on a scraped surface on the front of the bed by taper gibs at both end bearings. This construction together with the 70-degree angle on the back of the V overcomes any tendency of the carriage to climb the ways when the lathe is engaged on heavy work. The gibs are tongued in position in the carriage, and in combination with the special construction of the V, they automatically compensate for the wear; this makes it unnecessary to give any attention to the adjustment of the gibs. Wipers are provided, fitted with felt pads, which in addition to wiping off chips and grit from the sliding surfaces also provides for automatic oiling of the ways.

The lathe spindle is set back a certain distance (in this size of lathe, two inches) from the centre of the shears, which construction not only provides for an increased swing over the carriage, but at the same time permits the machine to be used at full swing without the tool overhanging the bed, a construction which adds greatly to the rigidity of the machine when turning work of large diameters.

The apron is constructed of a one-piece box section casting with all gears



One of a New Line of Lathes Manufactured by the London Machine Tool Co., Hamilton.

and studs supported at both ends. The apron has a wide bearing on the carriage, is held in position by four bolts, and is fitted to the carriage by means of a tongue. The single box section form of the apron, it is stated by the manufacturers, does away with the necessity of an auxiliary support at the lower end of the apron, and overcomes the difficulty of uneven wear between such lower slides and the V on the top of the bed.

The longitudinal and cross feeds are operated by a single friction, which, in addition to being of large diameter, is so placed in regard to the gearing, that it has but a light duty to perform.

Nine changes of speed for the lead-screw are obtained by means of the cone of gears and the tumbler. The tumbler gear is supported on a cylindrical bearing, and is securely locked in position by the plunger in the change handle. This construction is the same as has been used on the LeBlond lathes for some time. The nine changes mentioned above are quadrupled by the addition of a sliding gear transmission. The gears of this sliding transmission are operated by the lower lever. This construction permits of the use of a speed or index plate which reads directly, and from which the operator can see at a glance the position of the levers required for any desired speed. The changes can be made while the lathe is running under the heaviest cut. The gears in the gear box as well as all other feed gears are made from drop-forged steel blanks. The feed rod is driven by the same mechanism by means of gears connecting it with the lead-screw, the range of feed being from 4 to 120 per inch. The changes for the lead screw provided by the gear box are thirty-six in number, ranging from 1 to 30 threads per inch.

The feed box is connected to the spindle by means of gears, the intermediate one of which is mounted on a quadrant, which permits the use of compound gearing at this point if required, for cutting special or metric threads with a standard English pitch lead-screw. A metric pitch lead-screw can also be supplied, in which case the gearing arrangement permits of cutting English pitch threads with this screw, by using compound gearing in the same manner.

These lathes are manufactured by the London Machine Tool Co., Hamilton, who have arranged with the R. K. LeBlonde Machine Tool Co., for the manufacture of their lathes in Canada. These are made on exactly the same lines as those built in the United States.

SPIRAL GEAR CUTTING.

The illustration shows a Pratt & Whitney 6 x 14-inch thread milling machine arranged for the cutting of spiral gears. The relation between the inner and outer spindle by means of which indexing is accomplished, is controlled directly by the index plate and pawl. The quick return device which is very conveniently actuated by a crank located at the front of the machine is very rapid in operation.

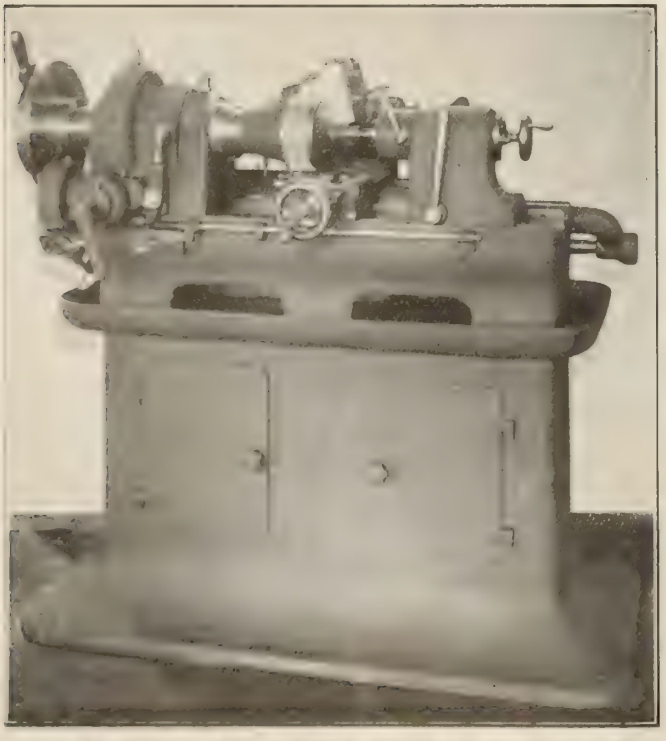
The machine is provided with precision lead and cross feed screws. Micrometer dial and positive adjustable stop give very accurate control of cutter head. One of the strong points of the thread milling machine is the locating of the cutter in a manner to prevent chip interference, which makes possible exceptionally fast feed without sacrificing quality of work. Three cutter speeds are provided. Eighteen carriage feeds for each speed of the cutter are instantly obtained by means of a geared feed box.

The machine and attachments have been placed on the market by Pratt & Whitney, Hartford, Conn.

INTERNAL THREAD MILLING.

The illustration shows a recently developed attachment for the milling of internal threads on the Pratt & Whitney thread milling machine. The cutter head, which is of rigid construction throughout, is made a complete unit and may be readily accommodated to the regular carriage. Its proper relation with the carriage is maintained by means of long dovetail bearings and a taper gib which may be readily adjusted for wear. The cutter head proper is so mounted that the necessary swiveling action for proper cutter clearance is obtained without disturbing the central relation of cutter and work, accurate graduations being provided for this purpose. The cutter head when set to the required angle is securely clamped to its seat by means of powerful bolts which makes it equal to a solid member in points of rigidity.

The cutter spindle which is made of tool steel is hardened, ground and lapped. It is provided with a taper



Pratt & Whiting Thread Milling Machine for Spiral Gear Cutting

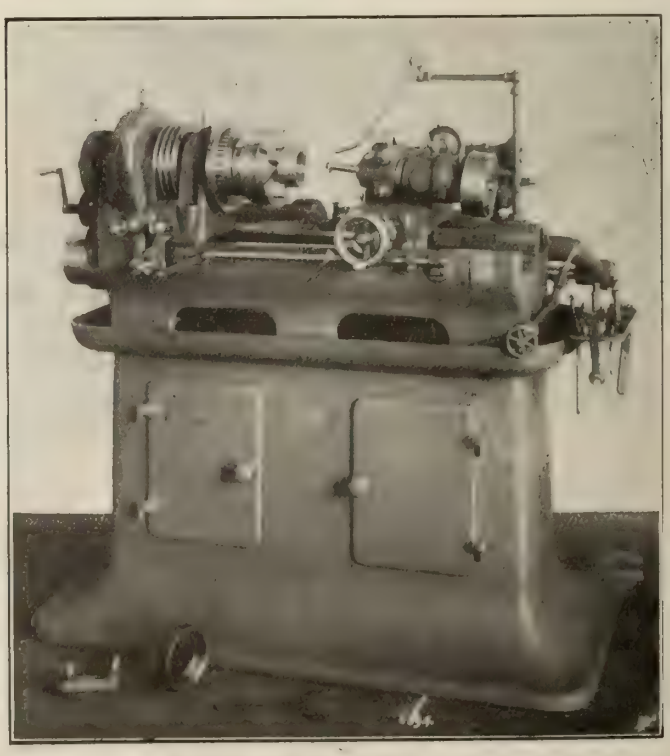


Fig. 1.—Pratt & Whiting Thread Milling Machine for Internal Thread Milling.

hole for the reception of the various cutter arbors, a drawback bolt being provided for holding the arbors in place. The bronze sleeve or box in which the spindle runs is mounted in the head in a manner to permit the longitudinal adjustment of the spindle,

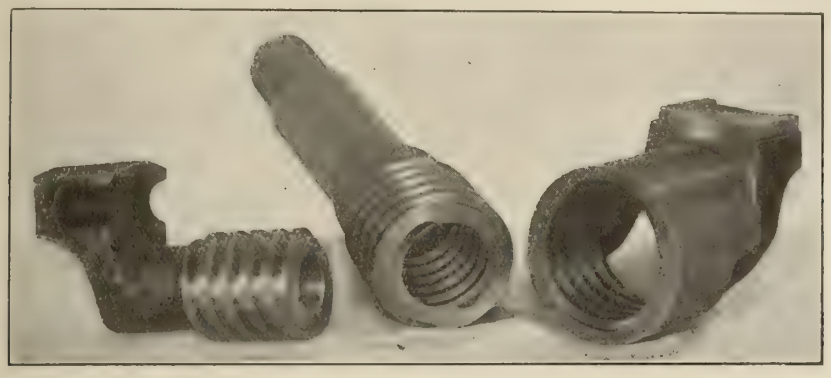


Fig. 2—Examples of Intricate Milling.

which is very convenient in re-setting the cutter to a previously cut thread. The cutter spindle is driven directly from the main driving shaft by means of gearing. Backlash in the driving gears which would tend towards the vibrating or chattering of the cutter, has been eliminated by the introduction of a fly-wheel. This fly-wheel is mounted in bearings independent of the spindle, yet in a manner to obtain the desired result very effectively.

A feature of the thread milling machine is the accurate and positive control of the cutter head obtained by means of the micrometer dial and positive adjustable stop. The simple and uniquely constructed stop which permits the withdrawing of the cutter from the work and accurately returning same to the exact previous depth, has proven especially valuable on internal work.

The cutter is provided with three speeds by means of a three-step cone. Eighteen carriage feeds are obtainable for each cutter speed through a gear box.

The machine may be arranged for the cutting of either single or multiple threads. When arranged for multiple threading, as shown in the illustration, the work-holding appliance is carried on the inner spindle, the outer spindle being provided with a very accurate index ring by means of which any multiple of thread desired may be cut. The index ring is very large in diameter in proportion to the work operated upon, therefore the tendency to inaccuracy is reduced to the minimum.

While the design of the spindle readily lends itself to the accommodation of the holding appliances necessary for the various classe of work, the step chuck and closer, as shown in place on the machine, has proven exceptionally efficient for work within its range. This step chuck, as will be noted, is provided with adjustable jaws, which are independent of the closing mechanism and when once set to the desired diameter or contour will hold the work rigidly and true. It is rapidly and conveniently operated by a drawback rod from the back of the spindle.

The attachment, as regularly made, is suitable for the threading of holes from about 1½ inches to 6 inches in diameter. It is equally well suited for single or multiple threads, either right or left hand. The machine may also be readily adapted for work out of the ordinary, a striking example of which is the device shown in the illustration.

The machine and attachments have been placed on the market by Pratt & Whitney, Hartford, Conn.

UNIVERSAL WOOD GEAR CUTTING MACHINE.

A new gear cutting machine has been designed and placed upon the market by the Newark Gear Cutting Machine Co., Newark, N.J., for the purpose of cutting the teeth of wood gears for patterns, especially spiral or helical gears. There is a wide field of work requiring heavy cast tooth "herring bone" or double helical gears, and such gears can be cast solid, from patterns cut on this machine. The pattern is in such case made in two pieces, one right and one left hand; but the casting is of course solid.

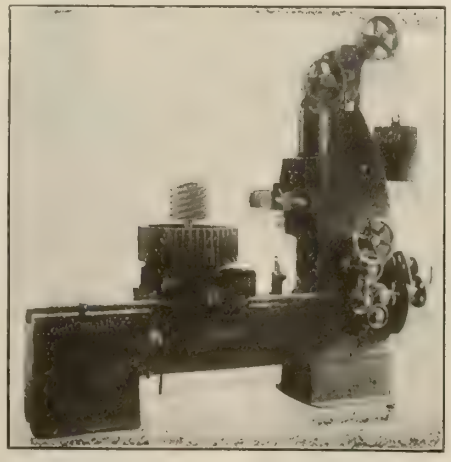


Fig. 1—Universal Wood Gear Cutting Machine for Cutting Spur Gear Patterns.

The machine has a capacity for spur gear patterns up to 8 feet diameter by 24 inch. face; and helical or "spiral" gear patterns up to 7 feet diameter by 24 inch. face. Any lead or angle of worm may be cut, as well as any numbers of threads; and any lead or angle of helical gear may also be cut. The range of pitches which the machine is capable of cutting is of course very large. By using fly cutters, all pitches ranging from 1 inch. circular up to 7 inch circular can be easily taken care of, and of course heavier pitches can also be cut by using regular rotary gear cutters.

In this machine, the feed is obtained by means of a hand wheel, operating a screw, with ball thrust collars. This hand feed is used, so that the operator may feed very fast during the full cut,

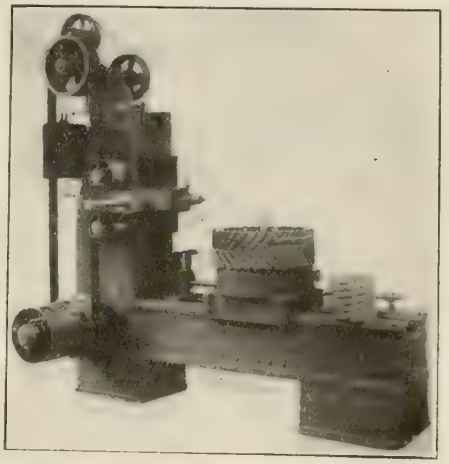


Fig. 2—Universal Wood Gear Cutting Machine for Cutting Helical Gears or Worms.

and may feed more slowly as the grain in the wood changes, or the cutter strikes a knot in the wood, or when the cutters come through at the end of the cut. After each tooth is cut the cutter carriage is returned to start a new cut, and the blank is indexed by the hand crank. A counterbalance serves to equalize the weight of the carriage.

The indexing is obtained by means of change gears. The operator makes one or more even turns of the crank, according to the index furnished.

All numbers of teeth can be cut, up to 100; and all from 100 up to 450, excepting prime numbers above 100, and a wide range of numbers above 450 can also be cut. When any unusual number is required, this can be arranged for, by means of an extra change gear.

In operation, the wooden pattern blank is mounted upon the work arbor, or upon the face plate direct. Blocks of

wood may also be cut on this machine, for use in gear tooth molding machines. A rim support is provided for taking the thrust of the cut, in large gears.

The face plate is solid with the dividing worm wheel, which wheel is made in two sections and generated in place, to secure accuracy. The dividing worm may be adjusted out of mesh with the wheel, to permit the blank to be rotated by hand. The dividing worm is also provided with adjustment for use in resetting, or in taking side cuts.

A complete guard protects the worm and wheel from dust and dirt.

The work head is adjusted on the bed, to take care of the various diameters to be cut, the adjustment being obtained by means of screw, with dial graduated to read to thousandths of an inch.

A noticeable feature of this machine, is the simple method of driving, as shown in Fig. 2, by means of an endless belt. The machine itself is driven by means of a tight and loose pulley arrangement on the machine; the pulleys running upon a rigid sleeve, and not upon the shaft, thus relieving the shaft of all strain of the belt pull, and eliminating the possibility of the machine starting up accidentally.

The cutters used on the machine, for heavy pitches, are shown in the illustrations. When cutting spur gear patterns, a formed fly cutter is used, mounted upon the spindle as shown in Fig. 1. This spindle makes 3200 revolutions per minute. When cutting helical gears or worms, an endmill form of fly cutter is used, mounted upon the endmill attachment shown in Fig. 2, making 4200 revolutions per minute. The spindles are of high carbon machinery steel, accurately ground, and run in phosphor bronze bearings.

Although the machine is designed for cutting wood, yet the design generally and the construction show distribution of the metal, with deep bed and box form of construction. This eliminates the tendency to vibration which would otherwise result from this class of work. The machine is very rapid in operation, as for example:—A wooden spur gear pattern, 10 teeth, 3 inch. circular pitch, 8 inch face, was cut in 30 minutes, cutting time. A motor drive can be readily provided for, as the machine pulley runs at constant speed.

AUTOMATIC CYLINDRICAL GRINDER.

The illustrations herewith show a new cylindrical automatic sizing grinder which has just been placed on the market by Pratt & Whitney, Hartford, Conn. The machine is designed for medium size work and has a capacity of 30 inches between centres, with a swing over bed of 4 inches, and can be adjusted to a maximum taper per foot of 2 inches.

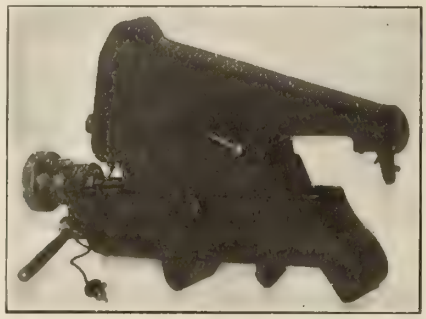


Fig. 3 Automatic Sizing Attachment.

The machine uses a 12-inch diameter wheel, with a face from ½ to 1¾ inches. Particular attention has been bestowed upon the table feeds and six changes have been provided for, any of which are immediately obtainable through a gear box and lever, the latter being located at the front of the machine, under the operator's hand. These feeds are independent of either wheel or work speeds. The reversing mechanism has been designed to effect reversal within 0.001 inch, a matter of considerable importance in grinding up to shoulders.

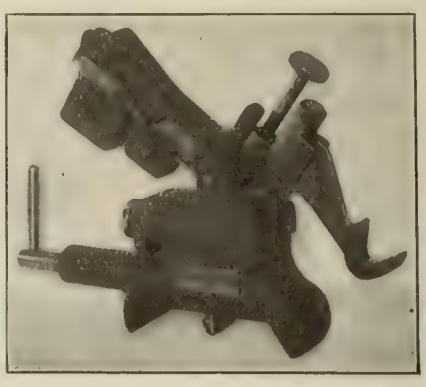


Fig. 4 Automatic Positive Feeding Back Rest.

The form of the table top has also received particular attention and is made with a flat top and angular sides, in order to insure accurate re re-location of attachments.

The most important recent improvement is the automatic sizing device as applied to this machine. This device when once set to the required diameter will automatically grind any number of pieces irrespective of the wear of the wheel.

In operation both roughing and finishing feeds are controlled and utilized, this not only greatly increases the production capacity of the machine but also insures far more accurate and uniform work than that resulting from ordinary micrometer measurement. A decided advantage made possible by this device is the ability of one workman to operate two machines to their maximum capacity without the slightest difficulty.

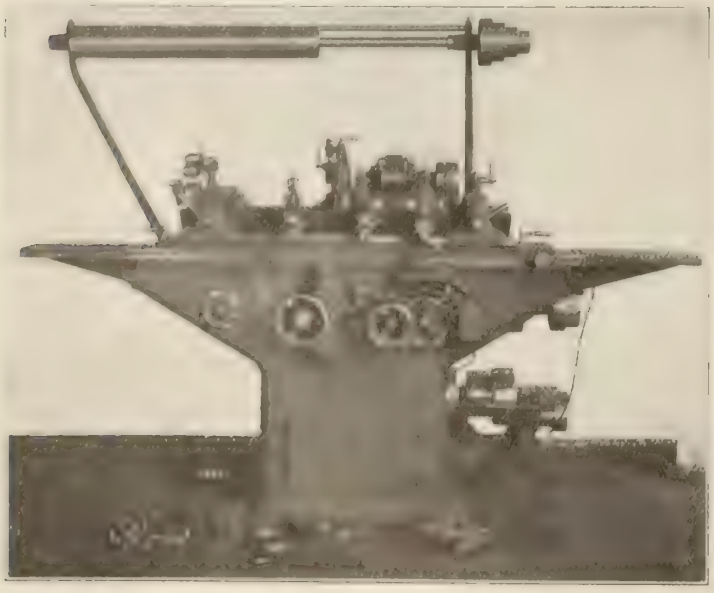


Fig. 1 Cylindrical Automatic Sizing Grinder.

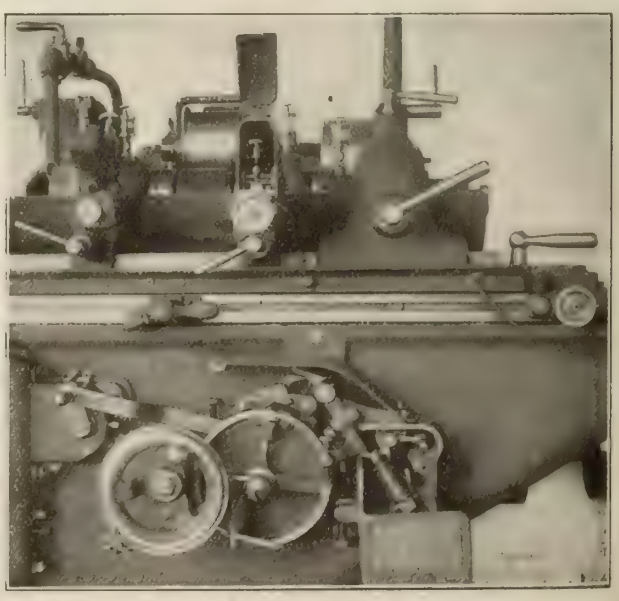


Fig. 2 Automatic Feeding Mechanism; Cylindrical Grinder.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

BELTS AND BELT DRIVES.*

By A. E. B.

BELTS and belt drives, the title of this article, will treat paticularly of the part played by leather belts as a means of transmission of power. Needless to say, their overwhelming, universal and undiminished use, stamps them as at once a subject of interest. One can hardly conceive of a factory without associating with it a belt drive, and our whole circle of readers is therefore expected to be benefited more or less. Such at least is hoped for.

Choice of Belt.

In the choice of a belt, the first consideration is that it be made from a

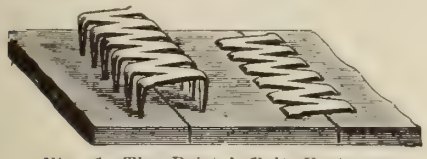


Fig. 1—The Bristol Belt Fastener.

good hide. All users are aware of the vast and varying range of quality offered at equally varying prices, and that it is no easy matter for the average purchasing agent to discern and choose to the best advantage his requirements. Some indicative opinion may be had by cutting a thin shaving from the samples offered, and tearing them between the fingers. Much belting is sold by weight, consequently unscrupulous dealers do not hesitate sometimes to impregnate the material with sugar and like substances, useless and worse than useless for any purpose, except increasing the seller's profits. The test already mentioned will enable even the unskilled to form an opinion as to how much of his purchase is leather, and how much simply weight-making material.

Lubrication and Stretch.

From the user's point of view, two things should be borne in mind. Dry leather is to be avoided and the belt should be thoroughly stretched.

Leather belts lose a good deal of their strength and nature unless impermeated with a certain amount of oil. Good quality cod oil is largely used for the purpose. This treatment gives pliability, ensures good driving qualities due to easy bedding of the belt on the pulley, and acts as a proof against the absorption of moisture.

*Part I. of the second article of the series of Power Transmission Equipment, Operation and Efficiency Subjects.

An ordinary belt thus lubricated, develops a stretching propensity, which is, of course, both troublesome and wasteful. For example, a new belt is put on to drive a machine, and in a few days it will probably have stretched some inches and be altogether too slack, necessitating a piece being cut out, wasted, and time taken to break and remake the joint.

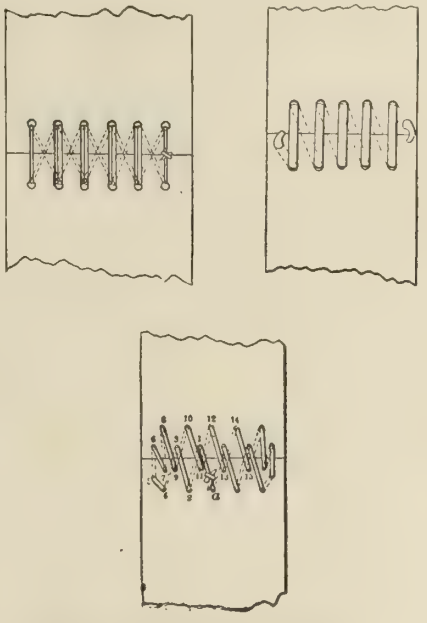


Fig. 2—Types of Laced Joints.

The problem, therefore, is to secure the admittedly advantageous features of "lubrication and stretch."

The solution is obvious—Stretch the belt fully before application. Many makers do put their belts through a stretching machine, and the belts benefit thereby; but the simple, rapid running through of a belt or parts of a belt is of little real use, seeing that the leather being in the same physical condition all the time, springs back to practically its original length as soon as the tension is let off.

A process of belt-stretching has, however, been introduced, having many commendable features and apparently successful beyond dispute. It is described briefly, as follows:

The hides from the tannery, prepared with a certain amount of moisture still in them, but with their oil dressing (in fact just in the condition in which most makers at once cut them up into belt strips) are taken to a special department fitted with special machinery. Each hide is placed over a strong frame and gradually stretched longitudinally until a 10 per cent. increase is reached; the lateral dimensions being meanwhile

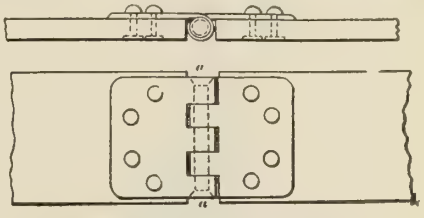


Fig. 4—Hinge Belt Fastener.

maintained by wedging. The required stretch having been obtained, the frame with its hide is taken away bodily and stored, sometimes for a period of several weeks, until all the moisture has evaporated. When released, there is little if any tendency to spring back to the original dimensions, the lubrication and pliability are maintained, and we have practically a stretchless butt of equal or even greater strength than before, and in ideal condition for cutting, jointing and the formation of a perfect belt.

The process involves considerable expense, and produces belts somewhat lighter, width for width, than unstretched belts, so that obviously higher prices per pound must be charged, but

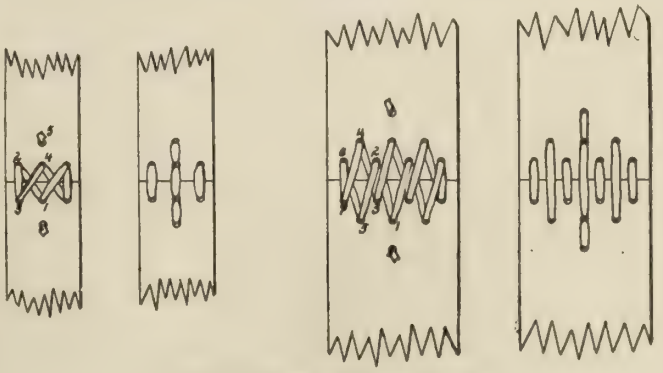


Fig. 3—Types of Laced Joints.



Fig. 5—The Jackson Belt Fastener.

the evidence goes to show that for lasting power, perfection of drive, and labor-saving, the belts are well worth their greater cost.

Strength of Belt.

The ultimate tensile strength of belting is not generally a factor in power transmission calculations. It varies from 2,000 to 5,000 pounds per square inch of net section in best quality leather belts, and may be reckoned at an average of say 3,500 pounds per square inch. This variation in ultimate strength is due not only to possible variation in the quality of the material, but to want of its homogeneity as well. Experiments go to show that strips of equal width and thickness taken from the same belting butt, gave breaking strains varying from 1,500 to 3,500 pounds per sq. inch.

Strength of Belt Joints.

The ultimate strength of a laced joint well put together should be taken at from 1,000 to 1,500 pounds per sq. inch, while that of a riveted joint may be taken as equal to one-half of the



Fig. 6. The Jackson Belt Fastener.

strength of the solid belt, 1,750 pounds per square inch. The working strength of the belt may, in practice, be taken as one-third the ultimate strength of the joint.

A series of tests of belts in actual use, showed the working strain to lie between 30 and 532 pounds per square inch. A commonly accepted working strain for best material of belt body, and substantial joint, is 320 pounds per sq. inch belt section, being 60 pounds per inch width for each 3-16 inch thickness, single belt. For double and treble belts the allowable strain would be 1.75 and 2.5 times that of single belts respectively. See belt creep.

Adhesion of Belts.

The motion transmitted by a belt is maintained solely by the frictional adhesion of the belt to the pulley rim surface. Belts do not communicate motion with precision on account of their liability to slip. With unequal diameter pulleys and an open belt, slippage will take place on the smallest pulley first, on account of the arc of contact being smaller. Crossing the belt makes the arc of contact the same on both pulleys.

A long horizontal belt increases the tension and arc of contact by its weight forming a curve between the pulleys. It should therefore drive from the under side. A belt running on a pulley on a vertical shaft requires stretching tightly because its weight lessens its contact. As a compensation, the belt

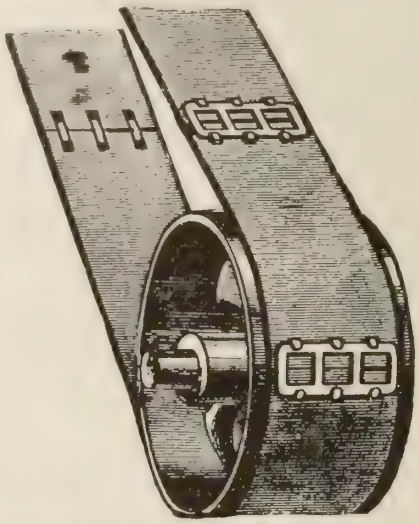


Fig. 7. Claw and Slide Belt Fastener.

should be broader than for a horizontal drive of equal power.

The adhesive grip of a belt is the same on cast iron pulleys, whether turned or not. It is greater however, on a wooden rim than on a cast iron rim.

Slippage of Belts.

A belt will slip just as readily on a pulley four feet in diameter as it will on a pulley two feet in diameter, provided the conditions of the faces of the pulleys, the arc of contact, the tension, and the number of feet the belt travels per minute, are the same in both cases.

A belt of a given width, and making any given number of feet per minute, will transmit as much power running on pulleys two feet in diameter, as it will on pulleys four feet in diameter, provided the arc of contact, tension, and conditions of pulley faces are the same in both cases.

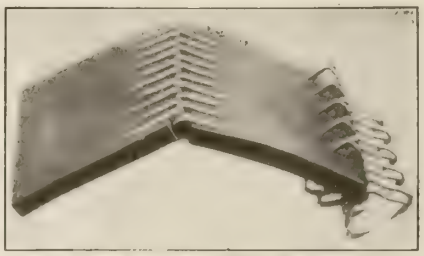


Fig. 8. Hinge Belt Fastener.

Causes of belt slippage are because they are overloaded, dirty, clogged, dried up and neglected. Slipping generates heat, and aggravates the trouble still further. The false, but common remedy of tightening up, or overtightening as it should properly be called, only results in straining the life out of the belt, increasing the coal consumption by increased bearing friction and disalignment of shafting.

It stands to reason that while slip may be prevented by undue tightening, this is not the right method to make the belt do its full duty justly. The added tension cannot help but increase journal friction, strain the shafting, increase the danger of hot boxes and worn bearings and increase the number of delays due to sudden belt failures, the prevention of which alone effects saving. No matter how well the bearings are lubricated, some of the pull on the belt is wasted in overcoming the added friction, and the capacity of the drive is reduced to the extent of overcoming this.

On the other hand, a belt that is kept

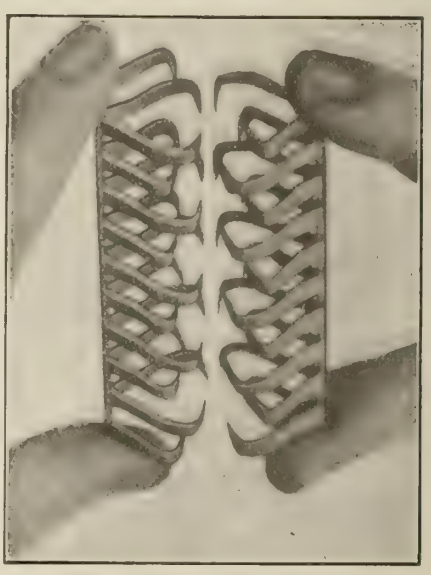


Fig. 9—Hinge Belt Fastener.

clean, mellow and otherwise in good condition throughout, by means of a suitable preservative, bends around the pulleys with less resistance and by reason also of a close conformity with unevenness of the pulley surface, can be eased or even run slack without danger of slip under full load. In fact, a belt that is properly filled and is of correct dimensions for its work, should break before slipping.

Preservation of Belting.

Engineers usually pay little attention to their belting except that which is giving immediate trouble, when as a matter of fact, proper treatment with a suitable preservative at regular intervals would greatly benefit all the belting. Not only would its life be prolonged, but by increasing the pliability and lubrication of the internal fibres, it would be kept softer, cling to the pulleys better, and run slack without slip, ensuring a saving of power that would much more than pay for the attention and cost of the preservative preparation. Anyone will understand this on considering that the natural in-

gredients of a leather, cotton, or camel's hair belt, manila or hemp driving rope, slowly dry out, and leave the contact surfaces hard. Unless something is added to replace these natural ingredients the belt or rope cannot be expected to grip the pulley close enough to transmit full load.

Creep of Belt.

By creep of belt is meant its stretching and contracting propensity as it passes over the driven and driving pulleys respectively, and is due to its inherent elasticity and nature of load. The tight side of the belt is under the greater strain, hence it stretches as it comes on the driver and contracts coming off. In a word, more belt length goes on to the driver than comes off it, and more comes off the driven pulley than goes on. The net result is that there is a continuous creep or shifting of the belt around the pulleys in a direction opposite to that in which the belt runs. Fig 10.

Belt creep in practice is usually kept within a one per cent. limit, and to make certain of its attainment, the working strain for best material belt body and substantial joint is taken at 40 pounds per inch width, single belt, with that for double and treble belts in the proportion already stated.

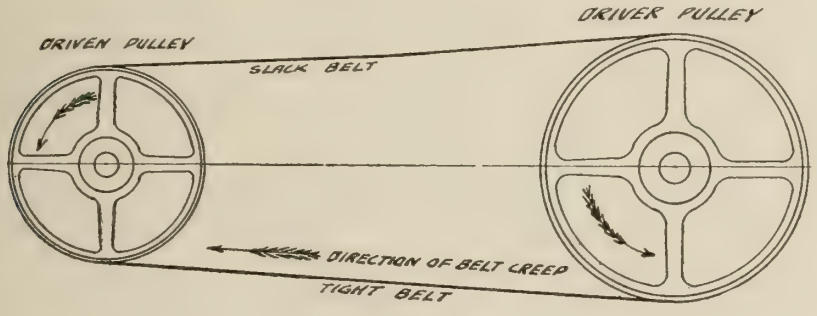


Fig. 10—Belt Drive.

Centrifugal Tension of Belts.

When a belt runs at a high velocity, centrifugal force produces a tension in addition to that existing when the belt is at rest or moving at a low velocity. This centrifugal tension diminishes the effective driving force.

Double belts are less pliable than single belts and the centrifugal force is greater, consequently the contact with the pulleys is less. Furthermore, the tension is seldom increased proportionately, and for these reasons, double belts should not be expected to transmit more than 8-5ths the power of single belts.

This power may be increased, however, by running two single belts on top of each other. Being thus more pliable they give better contact and increase may have a difficulty betimes in knowing just what to do, and have their back to the wall, they will be found efficient and satisfactory in operating results.

The power of belting is determined by the number of foot pounds which can be transmitted by one pulley to another, and is arrived at by multiplying the effective pull in pounds per inch of width, by belt width in inches and by belt speed in feet per minute; thereafter dividing by 33,000.

The effective pull or the force tending to turn the pulley is the difference in tension between the slack and driving sides of the belt, and is largely dependent on the arc of contact between the belt and the smaller pulley.

To find the effective pull it is necessary to determine the number of degrees in the arc of contact. This can be arrived at by multiplying the difference between the pulley diameters in inches by four and three quarters, dividing the product by the distance between the pulley centres in feet, and subtracting the quotient from 180 degrees.

Horse Power of Belting.

Users of belting are frequently misled as to the amount of work which should be expected of a good belt, with the result that it is put to an excessive strain and sent to the scrap heap in a short time, condemned as to quality.

This condition of affairs is due in large part to incorrect rules for calculating the power of belting.

These rules are in many cases wide apart in their results as are the poles, and the practice of them is so varied that hardly any two users adopt the same. In the face of this seeming utterly irreconcilable state of affairs, I make no pretension of pointing out where each errs, or of submitting a rule to which all others should give place.

The following explanation, however, of the considerations to be accounted and the rules accompanying, have been made the basis for numerous installations by the writer, and to those who

$$\text{Arc of contact} = 180 - \frac{(36-24)\times 4\frac{3}{4}}{18}$$

$$= 180 - \frac{12\times 4.75}{18}$$

$$= 180 - \frac{57}{18}$$

$$= 180 - 3.16$$

$$= 176.84 \text{ degrees.}$$

$$\text{Effective pull} = \frac{176.84\times 40}{180} = 39.29 \text{ lbs.}$$

$$\text{Horse power} = \frac{39.29\times 6\times 2000}{33000} = 14.29$$

Rules which take no notice of effective pull and known as empirical, have been likewise used by the writer to advantage, and are as follows:

$$\text{Single belts—horse power} = \frac{W\times V}{800}$$

$$\text{Double belts—horse power} = \frac{W\times V}{500}$$

W=width of belt in inches.

V=velocity in feet per minute=circumference of driving pulley in feet multiplied by revolutions per minute.

Example.—Taking belt width and velocity as in previous example we get

$$\text{Single belt horse power} = \frac{6\times 2000}{800} = 15$$

The result is practically the same in each case, but arrived at by a much simpler method in the latter case.

To get the horse-power that a double belt of the same width and velocity would transmit, the second formula would be used.

$$\text{Double belt horse-power} = \frac{6\times 2000}{500} = 24.$$

Figs. 1 to 9 illustrate some methods of belt jointing and a few of the specialties in common use.



WHAT IS SCIENTIFIC MANAGEMENT?

By G. C. K.

The question of "Scientific Management—What it is and What it will do," has been prominently brought before the mechanical men of America by the United States Interstate Commerce Commission. Expert testimony has been given by such men as H. K. Hathaway, of the Tabor Mfg. Co., manufacturers of molding machines; James M. Dodge chairman of the Link-Belt Co., Philadelphia; Henry R. Towne, president of the Yale & Towne Mfg. Co., Stamford, Conn., makers of Yale locks; Frank B. Gilbreth, New York; Henry L. Gantt; Harrington Emerson and Wm. Kent.

Wm. Kent sums up Business Management in a few lines. "Scientific management might be termed "applied common sense." It requires a man to do only that work for which he is best suited, but requires him to do that work at his greatest efficiency. It requires that he shall not do that work for which by training or environment he is unfitted and which someone else can do better than he. It requires that the conditions be made right for the greatest efficiency of the worker, this including not only the tools he works with, but his surroundings, his pay, and everything else which affects his work."

Andrew Carnegie stated some years ago: "Take away all our factories, our trade, our avenues of transportation, our money, leave me our organization and system, and in four years I shall have re-established myself." This, in brief, is what scientific management will do.

Passing of Rule o' Thumb Methods.

What it will do was given in an editorial in a recent issue of the New York Times. It states in a very concrete way what scientific management or system will do for any industry.

By rule o' thumb a man could unload two tons of pig iron an hour, for which his employer paid him 16 cents an hour. An observer, who had never handled a pound of pig iron, saw that the tracks in the foundry might be laid so that each bar need be carried not more than ten feet. By trial he saw that the average man unloading could move at a greater average speed. He saw that several of the physical movements used to transfer a bar from car to pile were unnecessary, consuming time and energy. In these three respects he established "units of efficiency," taking care, also, to provide a system of rest intervals to prevent fatigue. He then declared a standard of unloading pig iron at the rate of seven tons an hour to be easily practicable, and recommended a wage scale of 2.7 cents a ton, or 19 cents an hour, for the men who conformed to this standard. Under a sliding upward scale of wages, men were found willing and able to handle continuously ten tons an hour, for which service each received 27 cents. The increase in output was fivefold that under the rule o' thumb; the wages paid were seven-tenths greater, and the laborers were physically and financially better off.

"Gangs shoveled with the same shovel such different materials as coal, coke, iron ore, sand, and lime. A man who had not seen much shoveling done, but with trained powers of observation, determined that for each material a shovel which would hold 22½ pounds—a fair weight for the average laborer—should be of special size and shape. Then a set of necessary movements was devised with reference to physical leverages and speed. It was found, too, that a pile of lime or sand should be attacked at the top, and of coal at the bottom. Having fashioned the standard shovels, and devised the units of speed, movement, and weight, he found that the new method and a system of bonuses increased the efficiency of the shoveling gangs 150 per cent.

"For forty centuries the bricklayer stooped to pick up his bricks. The "efficiency engineer" devised platforms on jacks raised by boys to the level of the growing wall. Under the rule o' thumb the bricklayer for ages turned his brick any or all of three ways to find the face, tested the good bricks, picked up and threw down the defective ones, which had to be lowered from the height to which they had been raised, and turned his trowel to tap each good brick into the mortar. Boys now sort the bricks on the ground, piling the good ones face forward upon the platforms, and the brick sinks of its own weight into a new consistency of mortar. Bricklayers got $5 a day. Gilbreth enabled them to earn $6.80 a day, at the same time trebling their efficiency.

"Such methods kill rule o' thumb wherever introduced. They are not respecters of persons or of professions or of trades. They are usually introduced by outsiders—men who 'know nothing about the business.' "

Actual and Possible Savings.

In the December issue of Canadian Machinery the principles of scientific management applied to the repair and building of locomotives on the C. P. R. by Henry L. Gantt. These resulted in a saving of $65,000 per year. Harrington Emerson applying the priciples of scientific management to the Santa Fe railroad effected a saving of approximately $5,000,000 in three years. Such was shown by the testimony given before the Interstate Commerce Commission at Washington.

James M. Dodge pointed out the methods of management in the shops of the Link-Belt Co., Philadelphia, that made money. All work done in the shop is laid out for the workmen by a planning department in accordance with records based on accurate time studies of the fundamental operations of the job; the machine tools have all been standardized and their exact capacities are known; in the shop the work is supervised by functional foreman, each of whom attends to some feature of the work. By establishing a "system" the costs were reduced in the face of a rising labor and raw material market.

Some Pertinent Questions.

Writing to the Railway Age Gazette, E. T. Spidy, instructor Card Inspector, C. P. R. Angus shops asks the following pertinent questions. The foremen in various industries and railroad shops should carefully study them and strive to benefit by them. A study of them in detail will result in unprecedented savings and show "good management."

Is my piecework system in good condition—can I improve it in any way?

Have I machines that are overburdened or doing a class of work for which they are not suited?

In what conditions are the machines? Are they in a state of good repair?

Do any machines require re-speeding?

Am I using the best steel obtainable? Do I know what the best steel is?

Are my tool standards correct?

Do my men receive their tools in a satisfactory way?

How is the tool room stocked? Are there sufficient tools ready for delivery?

Do the men have trouble getting their work?

What kind of hoist service have the men at their machines for individual use?

Are the men provided with sufficient light?

Have you a proper belt-repair system?

Conclusion.

If managers, superintendents, master mechanics and foremen take the subject of Scientific Management seriously they will thank Louis D. Brandeis and the United States Interstate Commerce Commission for the valuable data which has been brought to light. Mr. Brandeis stated that the railroads of the United States were wasting $1,000,000 per day through lack of system. No doubt the railroads have done much towards scientific management and some industries have been wide awake, but there is still much to be done.

Scientific management when applied to the simple operation of loading a freight car with pig iron increased the performance of the individual from 12½ to 47 tons; when applied to shovelling coal it doubled or trebled the performance of the shoveller; when applied to the machine shop it developed, in certain operations, increases ranging from 400 to 1,800 per cent. This has been done in the face of the increased cost of labor and material. The principles are general in their application and where applied, valuable results will be obtained.

BUSINESS OPPORTUNITIES.

The C.P.R. have issued a second edition of their book on "Manufacturing and Business Opportunities in Western Canada," along the lines of the C.P.R. It is edited by John F. Sweeting, C.P.R. industrial agent, Winnipeg, and in addition to an index of stations, it contains an index to industrial requirements, facts in relation to the towns and cities of the West and tables of Western water powers. The following requirements for manufacturing concerns and power plants, are taken from this C.P.R. directory.

Agricultural Machinery—Fort William, Ont., and Winnipeg, Man.

Automobiles—Victoria, B.C.

Cement Plant—Southey, Lanigan, Weyburn, Macoun, Wilkie, Estevan, Francis, Outlook, Sask.; Edmonton, Bowden, Wetaskiwin, Crossfield, Penhold, Strathcona, Didsbury, Hardisty, Strome, Alberta; St. Boniface, Winnipeg, Man.; and Cranbrook, Kamloops, B.C.; Westfort, Ont.

Cold Storage—Saskatoon, Sask.

Can Factory—Victoria, B.C.

Engine Works—Stationary, Marine and Traction, Fort William, Ont.

Electrical Supplies — St. Boniface, Man.

Electric Lighting Plant — Holland, Souis, Pilot Mound, Rapid City, Man.; Swift Current, Lang, Lanigan, Elbow, Arcola, Sask.; Didsbury, Olds, Hardisty, Innisfail, Leduc, Granum, Alberta; and Port Moody, B.C.

Foundry—Saskatoon, Weyburn, Sask.; Camrose, Claresholm, Medicine Hat, Alberta, and Kamloops, Rossland, B.C.

Gasoline Engine Works—Portage la Prairie, Man.

Machine Shop — Saltcoats, Francis, Saskatoon, Strassburg, Estevan, Hawarden, St. Aldwyn, Perdue, Sask.; Shoal Lake, Glenboro, Rapid City, Morris, Man.; Wetaskiwin, Camrose, Amisk, Metiskow, Stirling, Alberta; and Armstrong, Rossland, B.C.

Motor Car Factory—Regina, Sask.

Nail Works—Fort William, Ont.; and Winnipeg, Man.

Planing Mill—Austin, Gimli, Man.; Weyburn, Sask.

Sash and Door Factory—Virden, Rapid City, Man.; Wapella, Arcola, Wilkie, Strassburg, Elbow, Sask.; Coleman, Alberta; and Fernie, Port Moody, Nicola, Enderby, Kitchener, B.C.

Saw Mills—Gimli, Man.

Smelting Works—Medicine Hat, Alberta.

Shingle Mills—Nakusp, B.C.

Wire Fence Factory—Calgary, Alberta

The G.T.R. Industrial Bureau announce the following openings for business along the line of the G.T.P. in Western Canada:—

Box Factory—Edmonton, Alta.

Brick Manufacturer — Lazare, Man.; Biggar, Waldron, Sask.

Carpenter Shop—Anoka, Otthon, Alta.

Foundry—Edmonton, Alta.

Societies and Personal

F. H. Sexton, director of technical education for Nova Scotia, is to accompany the Technical Education Commission on its visit to Europe.

* * *

A. J. Gaul, of Gaul & Girourard, Toronto, read a paper on "Diamond Mining in South Africa" before the Central Railway and Engineering Club on Jan. 17.

* * *

The closing of the works of the Canadian Fairbanks-Morse Co., Toronto, for a day, was a fitting tribute to the manager Percy C. Brooks, who recently lost his wife and three children in the burning of his home when he was in Chicago. The sympathy of Canadian Machinery and its readers, is extended to Mr. Brooks in his sad bereavement.

* * *

Walter J. Sadler, who for the past fifteen years has been connected with the firm of Sadler & Haworth, Montreal, manufacturers of leather belting, has been taken into partnership.

* * *

F. M. Brown, general purchasing agent of the Dominion Steel Corporation, has resigned to accept the position of vice-president and general manager of the Nova Scotia Car Works, the company that succeeds the Silliker Car Co.

* * *

The St. Thomas machinists will hold a ball on Feb. 16, in the Engineers' Hall. The following are the committees: Invitation committee, Stalker Booth, John H. Grey, Peter Erickson; music committee, W. E. Moore, Frank Clark; hall committee, Thos. Stone, John Lane; refreshment committee, Thos. Stone, W. E. Moore, J. H. Grey; chairman, J. Lane; secretary-treasurer, W. E. Moore.

* * *

Lake Superior Corporation.

Vice-President J. F. Taylor, of the Lake Superior Corporation, Sault Ste. Marie, has been appointed general manager and W. C. Franz has been made vice-president of the transportation interests of the corporation. Other changes include the promotion of C. H. L. Jones to the post of assistant secretary-treasurer, and that Consulting Engineer Ernst to general manager of the Algoma Steel Co., with C. E. Duncan as general superintendent.

* * *

Winnipeg Boilermakers.

Fort Garry Lodge 451, Brotherhood of Boilermakers, Winnipeg, held its annual smoking concert January 17, to which the C.P.R. were also invited. The chair was occupied by President J. Tumilson, and the programme which was contributed to by the best entertainers from both unions, was of very interesting character. Character songs and step dances were given by J. Crawford and J. Mugford, the other contributors including J. Hawthorne, W. Lawlor and J. Edwards.

At the recent annual meeting, the following officers were elected: J. Tumilson, president, re-elected; J. Handford, vice-president; J. Hume, financial and corresponding secretary; J. Tumilson, treasurer; J. Waddington, recording secretary; J. Hawthorne, inspector; R. Gardiner, guard; J. Handford, F. Magford and J. Tomes, trustees. The installation was conducted by J. Hume, past president.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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FRANCE

PARIS John F. Jones & Co., 31bis, Faubourg Montmartre, Paris, France

Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s 6d., per year; other countries, $1.50. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor on us by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. VII. February, 1911 No. 2

CANADIAN MACHINERY EDITORIAL INDEX.

At the close of the past year many requests came to us from subscribers of Canadian Machinery for an editorial index for use in binding their 1910 volume. In order that every subscriber may obtain the greatest use of his 1911 volume, we are numbering the editorial pages consecutively and at the end of the year, will issue a complete index of articles and authors, so that any article may easily be found by a reference to the index.

This is one of many steps forward which we contemplate taking and which will be announced from time to time. By means of these we hope to make Canadian Machinery of still greater use to our readers.

INCOMPETENCY AND INEFFICIENCY.

It seems that in the last analysis, the employer or responsible administrative head of a factory or corporation is he who determines the grade of efficiency of the undertaking.

We don't associate with an intelligent employer a stupid, ignorant official and administrative staff, but rather do we expect such a staff as will reflect his attributes.

The selection of men to fill the various subordinate appointments is not wholly a trial and error proposition, neither is it an evolution or "survival of the fittest." Definite, reliable, personal knowledge or experience of ability determines in large degree who shall fill the more responsible posts, and a corresponding line of action is again developed with regard to those further down the scale.

While it is possible to evolve men for positions, or have the position evolve as it were the man, and while such instances are of daily occurrence and necessarily so, it is inexpedient to operate from such a basis as a business principle.

We are accustomed these days to read and hear much about the cost of incompetence and inefficiency, and to see many more or less glaring spectacles of it, but what strikes one most forcibly about the two evils is their universality and existence in every walk of life. In the best and highest realms of human development and culture as well as in the lowest and ignorant, there is to be found incompetency, there is to be found inefficiency.

The question arises, can we minimise, escape from or cut out entirely this condition of things? It seems as though it were absolutely necessary to do so.

Escape from this dual curse, for such it is, does not of course imply that all men would be equally competent in any or every sphere of usefulness. The fault at the present time is that men don't fill their own individual niche to the best of their inborn and knowledge-nurtured ability, nor do they realize their intense, inherent possibilities. A keen discernment of one's proper sphere would do much to minimise that feature of incompetence and inefficiency which arises as a direct result of men operating in a wrong and unnatural department.

Being human, however, escape will be possible of only partial attainment, and we should not lose sight of this stern fundamental fact.

It is claimed that incompetency costs the city of Chicago one million dollars per day. John Wanamaker claims that incompetency costs his company twenty-five thousand dollars per day. Others again claim less or greater losses attributable to the same cause.

The basis of estimation is not stated, neither can we judge the standpoint of the estimator. To criticize and say there is certain loss, comes easy and is only wrong in degree, which at all events may be enough; but to charge the loss individually and in proper proportion and suggest a remedy, is neither easy nor pleasant if honestly and faithfully carried out. It is, however, the way to tackle the question properly, and most certain of remedial results.

Getting back to our starting point again, it will appear evident that the larger proportion of the loss is chargeable to the chief administrator, and he, if a factory owner, suffers in his returns just to that extent.

If it be the city of Chicago, the real administrators lose, to wit, the citizens. An inexorable law is therefore unfolded which metes out to all their share of punishment for neglect.

One thing must not be overlooked in this crusade against incompetency and inefficiency; the steady, certain real uplifting of mankind and its consequent change and raise of standard.

If Chicago by some means or other redeemed itself by saving that million dollars per day, and nobody will question its ability to do so if everyone did his or her own little part, if the employes of the Wanamaker company each added their little extra effort to what exists, if the "kick" that everyone makes and the losses claimed were satisfied, as they could easily be on the amounts specified, what then?

Would Chicago, John Wanamaker, you and I be satisfied? No, and why?

The realization of what was esteemed competency and efficiency, and which we prided ourselves in determining is not perfection as was thought.

We have much to be thankful for that the ideal will always keep ahead, and that the craving to reach to it

will still express the efforts made, as falling short through incompetence and inefficiency.

The standard of estimation will be rising all the time, as it has done and is, and will be found more exacting as it takes each time higher ground.

A scheme of education, not necessarily technical, which would dispose men to cultivate and use their intelligence in the selection of their proper sphere and the efficient filling of it, as a personal moral responsibility, while not ushering in the millennium, will obliterate to a great extent what are certainly at present monstrosities of incompetence and inefficiency.

MACHINERY MAINTENANCE SAVINGS.

At a recent meeting of the National Machine Tool Builders' Association, C. K. Lassiter, Mechanical Superintendent of the American Locomotive Co., read a paper on "The Design and Construction of Machine Tools from the User's Standpoint," in which he gave some excellent suggestions for the maintenance of equipment. By consistently carrying out a factory management system, giving specialized attention to the duties of caring for and maintaining equipment, large and almost inconceivable savings are made. By such a system, properly administered, the American Locomotive Co. have reduced the lost productive machine hours from 12 to 1¾ per cent. There are 9,000 machines in the plant. Formerly 1,000 were out of use continuously but now 100 machines is the average number out of service.

In the plant referred to, each department has an inspector who investigates the machinery for probable failures or for conditions which might cause accidents to employes. His findings are made out in the form of a report and immediate steps are taken to correct any condition which might render a machine idle. Where the design of the machine is at fault, it is strengthened or redesigned.

The following shows the working of the system as given by Mr. Lassiter :—

"In one of our shops, by referring to our reports, we found that 40 per cent. of the failures were due to negligence. We were able to reduce this item to 1¼ per cent. In another case we found that we were purchasing a certain machine from some of the machine tool builders, and there was an error in design which had existed for ten years on this machine, which was costing us something like $5,000 per year. We took the matter up with the machine tool builder and had the design changed. This charge was eliminated, which was like picking up so much money.

"We found that the maintenance on some machines which we had in service was so heavy that we could not afford to keep the machine in service, and we replaced them with modern tools. This also showed a decrease in maintenance."

Mr. Lassiter referred to the savings made by designing special machines :—

"Most of the tools which we purchase for our works at present are built to specifications prepared by ourselves, and it is our aim to cut out every gear or moving part on all machines which is not actually needed for our class of work.

"In specifying for planers, we require only one speed, as our work is so extensive that we can afford to put a planer on one class of work and never change it.

"On vertical milling machines we have specified the design so as to have but one pair of gears between the motor and the cutting tool.

"On large vertical boring mills we have cut out gear boxes and equipped the drive with a big plain pulley and placed a variable speed motor on the ceiling, where the counter-shaft had formerly been put.

"On radial drills we have lowered the speed of the driving shafts and increased their diameter, to reduce the maintenance on bearings."

By a system of tests machines were designed with a view to the economical use of power in operating machines. Mr. Lassiter says :—

"In testing out some of our machines we found that there was a considerable amount of power used for removing a certain amount of stock. A good deal of this power, we found, was absorbed through the friction of unnecessary gears. This is one reason why we have tried to cut out every gear possible on all of the machines which we purchase. It not only saves maintenance, but also cost of power to operate machines."

Keeping machines in service, cutting time between cuts, anticipating repairs and guarding against breakdowns means a great aggregate saving. It means that more work can be done with a certain number of machines when kept in good repair. Of course Canadian shops, or at least few of them, could keep a staff of inspectors busy in an elaborate system but even in the smallest shop a careful investigation and study of each machine will, in a great number of cases, result in an appreciable saving.

TOPICS OF THE MONTH.

It may seem a long step between manufacturing and sentiment but a kind word, an appreciative smile or a commendation for work well done will often increase the efficiency. These are often more effective in eliminating friction than so-called welfare departments planned on an elaborate scale.

* * *

In the January issue of Canadian Machinery we advocated providing sufficient vises in a machine shop. In addition to vises we might add clamps for lathe, planer and shaper, straps, etc. More time is often lost trying to find suitable tools, etc., than in the performance of the machine work. In the interests of economy we would suggest a complete equipment of these devices and a central place for keeping them.

* * *

Well lighted jig, tool and pattern storage rooms, tool room and machine shop are more likely to be kept clean than dark ones.

* * *

Recently a purchasing agent was quoted a price on car journal bearing metal. The metal was satisfactory but the price was high. By having an analysis made, he was able to call for tenders for a metal of the composition shown by tne analysis. The result was that a reliable firm furnished the metal at a considerable reduction over the first price asked. The saving in a year was therefore, considerable. By following this plan for all materials that can be bought by specification, large savings may be made.

* * *

The metal industry is thriving and growing apace in the mother country, in utter disregard of all pessimistic predictions. In this country only an occasional whisper is heard from those who see gloom ahead, and the whole trend of trade is in verification of the loudly expressed confidence of the best informed men in all lines of industry.

* * *

Plans have been prepared for the new machinery hall at the Ottawa Exhibition. Manufacturers of machinery deserve to be well treated by exhibition directors. It is to be hoped that the $75,000 voted a year ago for a new machinery building for the Toronto exhibition, will soon result in the erection of a more modern structure than that now designated as "Machinery Hall."

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

MOLDING HEAVY FLYWHEELS.

By J. H. Eastham.

Firms engaged in casting gas, oil, or steam engine parts, when faced with orders to meet customers' specifications, slightly different from, or "between" standard sizes, are often compelled to alter existing patterns, or to make new ones.

Obviously when an order is placed for a single engine this becomes a costly process, and in the case of flywheels weighing several tons each, can be easily avoided. A common system of moulding these castings is to select a pattern nearest the size required, but a little smaller, and to "lag" up the rim and hub with loose strips, and the arms with sheet lead, an unsatisfactory method at best, adding considerably to cost of production, often resulting in a lumpy casting, and causing much extra machining.

Assuming the job in hand to be of ordinary six-armed type, get a core box made full length from outside of hub to outside of rim, and tapering in width from one-sixth circumference of rim to one-sixth circumference of hub. Each core will thus contain one arm, which may be drawn out endways from hub or thick end.

Cores to form outside of rim are best made in sections about two feet or two feet six inches long, to facilitate handling when placing on stove carriage, and in mold afterwards.

Level a hard bed in floor at full depth of casting, and one foot larger in diameter, and place in centre a round cake core exact size of diamater of hub. Next place arm section cores in position around this; being careful to keep tight up to centre to avoid overlapping, afterwards lowering outside rim cores to place.

If not well equipped with cranes, place as many cores in position as possible during meal hour, to avoid keeping other jobs waiting. Ram up tightly round the whole, (reasonable floor pressure will prevent any strain,) and strike off level with top of cores to form flat joint. Place centre core into position and cover hub with a cake core perforated as desired for runners, insert gate pins, and vent pegs in holes provided in each arm core for purpose.

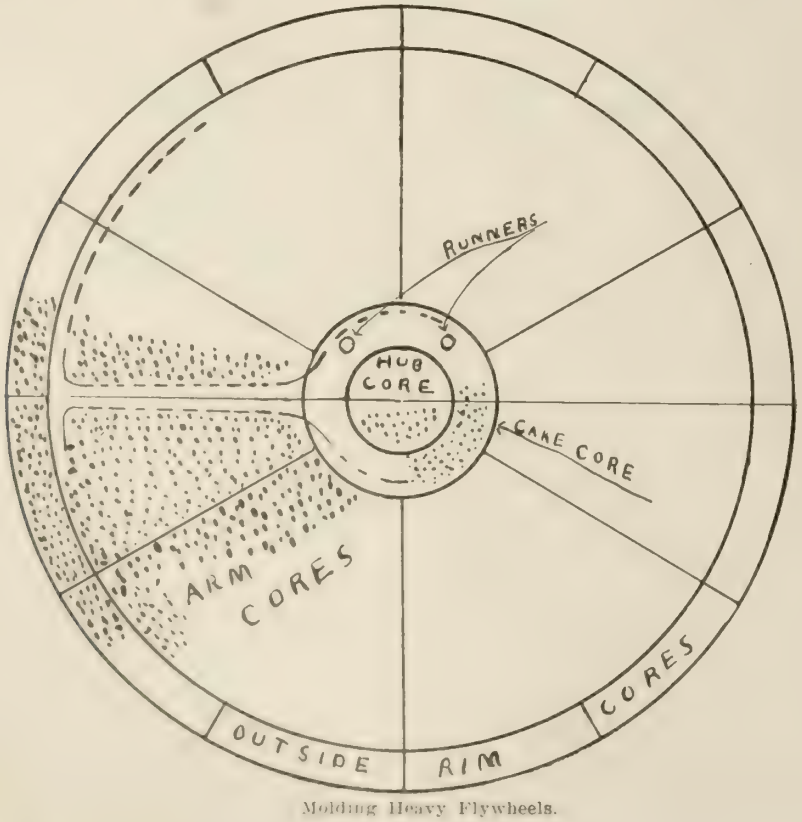
Stuff joints of all cores with waste, place large square cope part over whole, and ram up lightly. If not in possession of cope sufficiently large, spread one inch or so of sand over cores, and cover with handiest loam plates obtainable. Place runner box in position, large enough to hold at least 15 cwt. of metal in the case of castings weighing three tons or over. This may be dried or green, as considered advisable. Cover runners with ball or flat stoppers, and put weights in position, or bolt the whole down by cross bars to grid or plate in floor if possible.

When pouring, wait till runner box is full before drawing first stopper, and take out remaining 1 or 2, according to size of casting, singly.

Metal for these castings should be melted as hot as possible, and poured as soon as surface "breaks," to obtain best results, and should consist of about 16 per cent. good quality hematite, the remainder, hard scrap.

Good hematite iron, on account of its toughness, minimizes risk of breakage when running at high speeds. Should these castings show signs of sponginess in boring, decrease quantity of hematite a little, and add a small percentage white iron to close grain. Churning is optional, and depends largely on foreman's opinion and quality of metal used.

By the addition or removal of strips from core boxes to alter radii of cores, and thickness or depth of rim, and keeping in stock of pattern shop several sizes of arms, one set of boxes will serve for several sizes of castings.



Molding Heavy Flywheels.

PATTERNMAKER'S TOOL CHEST.

By H. J. McCaslin.

The accompanying photographs show the manner in which the up-to-date and progressive patternmaker carries his tools, and which has to a great degree replaced the strong box of bygone days.

This handsome case and contents of selected tools forms one of the finest pattern-making equipment that ever came under the writer's notice.

The case was designed and made by J. E. Rexroth, an employe of the Wellman, Seaver, Morgan Co., of Cleveland, O., through whose courtesy the photograph was obtained.

The body construction is that of a substantial sample case which it closely resembles as shown in Fig. 1. While it might be said one would not inspire to carry it any further than necessary, very little trouble would be experienced in getting it to and from the car, thus saving the expense of the expressman, to say nothing of the delay and vexation in not always being able to get your tools at the expected time.

Its proportions permit a 26-inch saw by removing the handle of the saw to be carried, and also a 24x14 inch. steel square. The heavier tools, as the plains, are carried at the bottom of the case



Fig. 1– Patternmaker's Tool Chest—Closed.

below the lawer drawer, which is shown removed, Fig. 2.

Attached to the back of the panel which is dropped down so as to expose the chisels and bits and their manner of arrangement and support is the steel square, shrink rules and triangles. To the young patternmaker who contem-



Fig. 2—Patternmaker's Tool Chest—Open.

plates leaving the home shop at the completion of his term of instruction and taking to the road in search of experience and wealth, secure a case similar to that here described, if you have not already done so. Should you not care to enlist as heavily into the undertaking as herewith shown, invest in a good substantial suit case and fit it up with drawers which will answer the purpose admirably.

CANADIAN AGENCY HILL & GRIFFITH.

The Rupert G. Bruce Co., Toronto, have been appointed Canadian agents for Hill & Griffith, Cincinnati. The lines of this firm which will be carried in stock in Toronto, include stove plate facing, heavy machine bag facing, "Ideal" core wash, Haskin patent ventilated chaplets, "Faultless" core compound, Rhode Island heavy bag facing, H. & G. blacking, white pine charcoal facing, special taper snap flask of sheet steel with malleable trimmings, tumbling barrels, cupolas, electric and hand cranes, brass melting furnaces, both oil and coke fired, cupolo blocks and bricks, fire clay and molding sands.

Hill & Griffith have seacoal mills in Birmingham, Alabama, and plumbago mills in Cincinnati.

Mr. Hill, who is known to the trade as "Honest John," has some strong arguments in favor of his products and calls attention to the H. & G. facings by means of an old and trite saying: "If you want to find out if a horseshoe is hot, pick it up. You are not obliged to take the blacksmith's word for it."

"Likewise," says John, "you are not obliged to heed our argument which necessarily has to do with our foundry facings and blackings, their use and abuse."

PITTSBURG EXHIBITION.

Final arrangements for the exhibition of foundry and pattern shop equipment, machine tools and supplies, to be held under the auspices of the Foundry and Machine Exhibition Co., successor to the Foundry and Manufacturers' Supply Association, at Pittsburg, during the week of May 22, 1911, were made at a meeting of the executive committee of this organization held at the Fort Pitt hotel, Pittsburg, Jan. 20 and 21. The buildings of the Western Pennsylvania Exposition Society, on Duquesne Way, in the centre of the Pittsburg business district, have been obtained for this exhibition of foundry and pattern shop equipment. A total of approximately 35,000 square feet of floor space will be available in two large buildings and in a temporary structure which will be erected between these buildings. All of the operating exhibits, such as heating and melting furnaces, core ovens, mold and ladle dryers, etc., will be located in the temporary building. The facilities provided for exhibition purposes are unexcelled, and shipments can be unloaded onto the grounds from Pennsylvania railroad sidings. It has been decided to conduct the exhibit during at least two or three evenings of the week, which will afford an opportunity to many of the foundry operatives of the Pittsburg district to attend the show.

The cost of space has been fixed at a minimum of only 50 cents per square foot, with an additional cost of $10 for corners. An exhibition permit, for which a charge of $25 will be made, will also be required by all exhibitors, as well as those conducting business of any kind in the exposition buildings. The large music hall on these grounds has been obtained for one evening during the week for a high-class entertainment to be given by the Foundry and Machine Exhibition Co. The headquarters for the exhibitors will be at the Fort Pitt hotel.

During this week the annual conventions of the American Foundrymen's Association, American Brass Founders' Association and the Associated Foundry Foremen will be held in Pittsburg, and the attendance of foundrymen from all over the United States and Canada promises to be unusually large. As this city is the centre of the steel manufacturing industry of the United States, and as some of the foundries in this district are among the largest and most modern in the country, unusual opportunities will be afforded foundrymen to familiarize themselves with the practice of these works and an extensive plant visitation program is now being outlined.

BREAKING OF GATE IN MOLD.

Experienced molders always know what the breaking of the gate in a mold before dumping means. It always indicates, in brass or bronze, that the metal is not good and that it contains impurities which render it red-short. By the breaking of the gate in the mold is meant that it breaks or cracks itself while cooling. In good metal, it remains firm so that when the mold is dumped, the castings, gate and runner are solid.

There are several elements that will cause red-shortness in brass or bronze, but sulphur is the principal one. As it causes red-shortness in iron or steel, so it produces the same result in the copper alloys.

Sulphur is very readily introduced into bronze or brass by the fuel, and especially when coke or coal, instead of charcoal, is used as the covering for the metal in the crucible. These fuels always contain more or less sulphur which is introduced into the metal to a greater or less extent. Charcoal, however, contains no sulphur and this is why it is so good a covering for molten metals.

If molders are experiencing difficulty from bad castings and the reason is not clear, let it be noticed whether the gate cracks in the mold, and if so look for the presence of sulphur in the metal. It has been found to be the cause of some of the difficulties encountered in the brass foundry.—Brass World.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

MONTREAL. The Montreal Harbor Commission has purchased a block of property near the river, on Notre Dame Street. Repair shops will be erected.

OXFORD, N.S.—The Oxford Foundry & Machine Co. have the contract for the heating equipment for the Bank of Nova Scotia's new building here.

WELLAND, ONT.—The Robertson Machinery Co. has made an assignment to J. F. Gross, for the general benefit of its creditors. The company has been insolvent for some time.

GALT—The Galt Foundry Co. have their new plant completed and expect to take off the first heat in a few days. Wm. E. Demill, formerly of Clark & Demill, Hespeler, is manager of the new company. A. J. Colvin is associated with him.

WINDSOR, ONT.—Plans are being drawn for a new dry-dock at Amherstburg, with a 600-foot capacity. It is also intended to have a shipbuilding plant, with the necessary machine shops. Windsor, Amherstburg and Toronto capitalists are interested in the scheme, which will cost about $250,000.

CALGARY, ALTA.—Mayor Mitchell advocates the erection of a municipal repair shop. He is of the opinion that much time and money is lost through sending small jobs to outside machine shops for repairs, instead of having a couple of men and proper machinery to handle them.

WEST TORONTO—The C. P. R. has secured a permit for the erection of a $20,000 repair shop here, on the west side of Keele Street, north of the subway.

LETHBRIDGE, ALTA.—Donovan & McCrea are erecting a building at Bow Island to be used for a machinery business.

HESPELER, ONT.—W. Ewald, of Preston, has been appointed manager of the Hespeler Machinery Co.'s shop.

GOWGANDA, ONT.—The machine shop at the Bartlett mines here was destroyed by fire recently.

MONTREAL—The Canadian Rotary Machine Co. will locate here.

THE WATEROUS ENGINE WORKS have submitted building specifications for an addition to their present factory, to cost $45,000.

MAISONNEUVE, QUE.—Street construction work has just been commenced on the new $100,000 building being erected for the United States Shoe Machinery Co. The masonry and carpentering contracts are the only ones let, in addition to the foundation and steel construction.

VANCOUVER, B.C.—The Western Steel Corporation have purchased 300 acres on the south side of the Fraser river. About $2,000,000 will be expended on construction of buildings and wharves and instalation of machinery.

MONTREAL—The National Steel Co. are erecting a large plant at Longue Pointe, to cost one million dollars. General contract awarded to Peter Lyall & Sons.

MORRISBURG, ONT.—The Tack Factory has now thirty machines in operation, and twenty more have just arrived. There is also in operation one shoe nail machine with a capacity of one-half ton a day. Mr. Russell has just returned from Toronto, where he secured orders amounting to over nine tons. Two more expert tack makers have arrived, and are now at work.

HALIFAX, N.S.—Fred M. Brown, formerly of the Steel Co., whose appointment as vice-president and general manager of the Nova Scotia car works was announced recently, is here. Mr. Brown is a Montreal boy and has a thorough grasp of mechanical affairs, as well as a mastery of the details necessary to the discharge of the duties as purchasing agent in a great company like the Dominion Steel Corporation.

MONTREAL—New plans of the C. P. R., as announced by W. Whyte, here, include 100 miles of double-tracking and 300 miles of new track in the west. New yards will be laid out at Regina, Moose Jaw and Medicine Hat. Four new steel bridges will be erected. Old 60 pound rails on the Manitoba and Northwestern branch will be replaced by 80 pound steel for a distance of about 160 miles.

OWEN SOUND, ONT.—A Cleveland firm is contemplating the erection of a cold-pressed steel works here.

BROCKVILLE, ONT.—Wm. J. Nute & Sons have purchased the boiler works owned by Black Bros. The new firm will manufacture boilers, hot water heaters and do general repair work.

VANCOUVER, B.C.—W. Price, of Seattle, general manager of the Western Steel Corporation, proposes to start the construction of a $500,000 merchant steel plant near Sudbury by April 1. The directors have secured 300 acres.

WELLAND, ONT.—The Canadian Automatic Transportation Co., with head office in Toronto, will erect a plant here for the manufacture of automatic carriers. The principal product is a storage battery truck scale for handling freight.

COBOURG, ONT.—A new mill has been erected for the Provincial Steel Co. here, and machinery is being installed.

MONTREAL—Foss & Fuller, machinery dealers, have dissolved.

TORONTO, ONT.—Application has been made to the Provincial Secretary of Ontario on behalf of the Timmins-McMartin-Dunlop Syndicate for a charter for a milling, concentrating and refining company of $500,000 capital stock. The name of the company is to be the Porcupine Gold Mining Co. It is proposed to erect at once a mill having 30 stamps at the outset, and so built as to enable its capacity to be easily increased upon demand. Besides working on the ore of the mining interests associated in the company, the plant will be used on custom business.

HALIFAX, N.S.—The city council has voted to give exemption from taxation for 20 years to the Nova Scotia Car Works, which is to take over the works of the Silliker Car Co. Also the new company is to receive free from the city 5,000,000 gol. of water every year.

CALGARY, ALTA.—The Board of Trade is in communication with American inquirers who are considering the establishment here of works for the manufacture of gas engines, stoves and heating apparatus.

GALT, ONT.—The Galt Foundry Co., whose new premises were completed this month are already making castings for the trade.

TORONTO—The Fairbanks-Morse Co. have taken out permits for a new $13,000 foundry and foundry cleaning and pattern room, at 1363-1369 Bloor Street West.

WEYBURN, SASK.—The Birrell Motor Plow Co., of Winnipeg, are negotiating with the authorities regarding the establishment of a factory here.

TORONTO, ONT.—J. L. Richardson & Co., dealers in machinists' and foundry supplies, have assigned to Richard Tew.

REGINA, SASK.—The Holt Caterpillar Co., of Stockton, California, will establish a distributing centre here in the spring for their traction engines.

LONDON, ONT. An automobile factory is to be located here. Hugh Kennedy, of Galt, and W. J. and Frank Reid, of this city, are interested.

GANANOQUE, ONT.—The D. F. Jones Co. has added a night gang and is keeping its rolling mills in constant operation.

AMHERST, N.S.- Extensive improvements are being made in the shops of the Canada Car Co. here. There are orders on hand to keep the works busy till next June.

ST. STEPHEN, N.B.—The Maritime Edge Tool Co., here, has made large additions to its factory.

ORILLIA, ONT.—The Canadian Refining & Smelting Co. has its building up, and is putting in the plant for treating high-grade Cobalt ore.

SHERBROOKE, QUE. The Canadian Fairbanks Co., manufacturers of weigh scales, will double the manufacturing capacity of their plant here.

QUEBEC, P.Q. The Dorchester Electric Co. is to build machine shops here, at a cost of $200,000.

CHATHAM, ONT.—The Dowsley Spring & Axle Co. is making extensions to its plant.

OTTAWA, ONT.—Henderson Bros., of Bruton, England, have decided to establish a factory in Ottawa for the manufacture and hair-cloth machines and patent horizontal saws.

LONDON, ONT.—The Superior Machinery Co. has obtained a charter.

TORONTO, ONT.—Sellew Motors, Ltd., has obtained a charter.

VICTORIA, B.C.—Among the companies either licensed or registered during the last week of December to do business in British Columbia, are the Burrill Rock Drill Co., Record Foundry & Machine Co., Hallidie Machinery Co.

JOLIETTE, QUE.—The Joliette Steel & Iron Foundry is the name of a new manufacturing concern at Joliette, Que. The company intend dealing in machinery and supplies, steel and iron castings of all kinds. They have opened an office and show room in Montreal, under the management of J. D. Query. The new company has absorbed the business formerly carried on by the Joliette Foundry Co. They also contemplate manufacturing some specialties in the near future.

HAMILTON—Fire, supposed to have been caused by the ignition of crude oil used to facilitate the handling of rolled steel, completely destroyed the Hamilton Steel & Iron Company's rolling mills, at the corner of Queen and Barton, recently. The frame shell, in which the valuable rolls, furnaces and hot beds were located, was burned to the ground. The forge and axle department, which is situated immediately west of the mills, was also badly damaged. The loss is estimated at $12,000.

LONDON—Alexander Gauld, brass finisher at the Labatt Box Co., is organizing a foundry company here, which promise to employ in a short time 100 men. The output of the foundry will consist of all sorts of plumbers' castings, pipings, etc.

ST. CATHARINES, ONT.—The Steel & Radiation Co., of Toronto, has agreed to erect a new factory here, to begin active operations by the end of the year, employing 100 men with an annual wage roll of $50,000 for the first three years, and afterwards 250 men with an annual wage roll of $125,000. The city gives the company a site of 35 acres, with a fixed assessment of $5,000 for three years and $10,000 for the next seven years.

ELECTRICAL NOTES.

TORONTO—Debentures to the amount of one million dollars will shortly be issued by the city in connection with the construction of the civic power plant.

VICTORIA, B.C.—The electric lighting by-law ($25,000) was carried.

CALGARY, ALTA.—The machinery at the big dam of the Calgary Power Co., on the Bow river at Kananaskis, is nearly all installed, and if nothing unforeseen occurs the company will be in a position to supply power in Calgary by the date agreed upon, April 1, 1911.

SASKATOON—E. L. White, city electrician, has prepared estimates calling for an expenditure of $140,656 for a light and power plant. The proposed changes would double the capacity of the works.

WINDSOR, ONT.—Windsor has secured the Canadian branch of the Moloney Electric Co., of St. Louis, Mo. The Moloney Company manufacture electrical machinery on an extensive scale. They are erecting a temporary building, in which manufacturing will probably start within two months.

ELKO, B.C.—The British Columbia Electric Co. will uild a plant here for developing power.

GRAND FALLS, N.B.—The Maine & N. B. Electrical Power Co., of St. John, N.B., will build a new line here and erect a large power plant.

HESPELER, ONT.—A municipal electric lighting system will be installed here.

OTTAWA, ONT.—The Ottawa Electric Railway is building a new power house.

WATERLOO, ONT.—$50,000 will be spent on an electric lighting plant here.

OTTAWA, ONT.—American and English capitalists will establish an electric smelting plant at Chat's Falls, on the Ottawa river, in the spring.

PORCUPINE CITY, ONT.—C. L. Sherrill, of Buffalo, is preparing to erect a power plant here to facilitate the development of this district.

CAMROSE, ALTA.—The municipality-owned power plant here has been opened and is now in operation.

STRATHCONA, ALTA.—Steps are being taken to increase the capacity of the municipal electrical plant. About $70,000 worth of machinery will be purchased, including a 600 kilowatt generator and engine and the necessary boilers.

KINGSTON, ONT.—Mr. Beach, of Iroquois, has options on water powers adjacent to Calabogie, Renfrew Co., Que. He is planning two generating plants, a main one at High Falls, and a secondary one at Brockville.

WELLAND, ONT.—The Falls Power Co. has sold its lighting system to the Welland Electrical Co. This includes the street lighting here.

PORT HOPE, ONT.—A by-law granting a 30-year franchise to the Seymour Electric Power Co. has been carried.

WINNIPEG—The Winnipeg Electric Railway has secured a permit for a new turbine power building, the estimated cost being $72,000. It will have a turbine engine of 12,000 horse-power.

INGERSOLL, ONT.—The by-law to appoint a commission to control the electric light and power utility was carried.

GRAND FALLS—The Grand Falls Power Co., of which Sir William C. Van Horne is one of the leading spirits, is preparing to begin active operations towards the development of a big industry at the Falls.

WINNIPEG, MAN.—The Board of Control accepted the tender of the Seamens Dynamo Works, Toronto, for the 500-kilowatt generator sets for the power station. Their tender amounted to $16,410.

BROCKVILLE, ONT.—J. Wesley Allison, of the New York & Ontario Co., states that drills, boring machines, boilers and hoisting apparatus for the power plant at Waddington, were now being secured, so that work could be commenced early in the spring, and that electrical machinery, water wheels and other machinery necessary had been contracted for.

BRANTFORD, ONT.—Hal Donly, Simcoe; W. S. Brewster, R. E. Ryerson, John Muir and W. D. Schultz, of Brantford, are applicants for a charter for an electrical radial line from Brantford to Port Dover.

BOWMANVILLE, ONT.—The plebiscite in favor of the electric light being managed by commissioners carried.

BROCKVILLE, ONT.—The by-law to amalgamate the light and water commissioners carried.

MEDICINE HAT, ALTA.—The new electric power house here has been completed and machinery is being installed. A regulator station is being erected near the power house.

WEYBURN, SASK.—Owing to delay in the arrival of machinery, the new power house and electric service will not be ready for use until March.

ST. JOHN, N.B.—The Maine & New Brunswick Electrical Power Co. will build a line from its plant at Aroostook Falls to Limestone, Van Buren and St. Leonards, running near Grand Falls. Besides selling power to the towns, it is the object of the company to furnish energy for the construction of the large paper mill to be built on the St. John river at Grand Falls.

WINNIPEG, MAN.—It is reported that private corporations, believed to be backed up by C. N. R. interests, are securing every available hydro-electric site on the Winnipeg river below Lac du Bonnett and Point du Bois, where the city is completing its $2,000,000 power plant. There is a rumor to the effect that it is planned to underbid the city in the sale of surplus power.

HAMILTON, ONT. The Hamilton & Port Dover Electric Railway Co., which has obtained provincial charter to construct an electric line between Hamilton and Port Dover, at an estimated cost of $1,000,000, will build its power house at Caledonia. George Lynch Staunton, K.C., Hamilton, is to be president of the company.

OTTAWA, ONT.—Sparks Street, in this city, is to have a "White Way." The municipal electric department has charge of installing the service and expects to have the lights going before the end of January.

QUEBEC, P.Q.—The Dorchester Electric Co. has obtained the consent of the municipal authorities to extend its system into this city and sell electricity.

HAMILTON, ONT.—The directors of the Dominion Power & Transmission Co. have placed an order with the Canadian Westinghouse Co. for a new generator, to be installed at the former company's power works at De Cern Falls. The capacity of the generator is to be 8,500 h.p., and its cost to be $200,000. The power company is also arranging to build another sub-station in Hamilton. This will cost $100,000.

BOWMANVILLE, ONT.—A franchise was voted to the Seymour Power & Electric Co. in this town, on Dec. 27.

PETERBORO, ONT.—The Can. Gen. Elec. Co. will construct a power house on the waterworks dam, near here. Bids are now being received.

NEW COMPANIES.

TORONTO, ONT.—The Augustine Automatic Rotary Engine Co., capitalized at $1,000,000 has been incorporated.

LONDON, ONT.—The "Superior Machinery Co." has been incorporated. The promoters are J. Fitzgerald, E. W. Scott, G. E. Scott, and T. Bryan, manufacturers, and J. B. P. Tanton, merchant, all of this place. They have taken over the business formerly known as The Superior Repairing and Mfg. Co. and will deal in all kinds of machinery. The head office will be here.

TORONTO, ONT.—Barr Registers Co., has been incorporated with capital of $50,000. They will manufacture registers and store devices. Among the directors are W. H. Matthews, A. E. Bywater and J. A. Stevenson, M.D., of Trenton.

ST. JOHN, N.B.—C. J. Salmon, W. G. Salmon, H. G. Adams, M. A. Hatheway and G. Dodge, of St. John, are applying for incorporation as "The Globe Steam Laundry, Ltd.," to be located here.

OTTAWA, ONT.—The North Fork Power Co. have been incorporated.

The Byrnes Mfg. Co., of Collingwood, has been incorporated. They will carry on a wood-working business.

VANCOUVER, B.C.—The North American Lumber Co. has been incorporated in British Columbia. The manager, H. L. Jenkins, has his head office here in the B. C. Trust Block, on Pender Street.

HAMILTON — Hamilton Machinery Co., Hamilton, Ont., have been incorporated to carry on business of mechanical engineers and manufacturers of machinery, with a capital stock of forty thousand dollars. Those

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MONTREAL—Standard Machines Co., of Montreal, has been incorporated to manufacture all kinds of engines and machines. G. V. Cousins and O. B. MacCallum, barristers, P. F. Brown, stenographer, W. R. Ford, clerk, S. T. Mains, bookkeeper, all of Montreal.

MONTREAL—Canadian Steel Foundries, head office at Montreal, have been incorporated to manufacture and deal in machinery. G. O.Cousins and O. B. MacCallum, barristers, S. T. Mains, accountant, P. F. Brown, secretary, and W. R. Ford, clerk, all of Montreal, are the incorporators.

VICTORIAVILLE, QUE.—The Victoriaville Chair Mfg. Co. has obtained a charter.

ST. JOHN, N.B.—Michael Sullivan, of Kingston, has been awarded the contract to build the armory here. It is estimated the building when completed will cost about $250,000.

SHERBROOKE, QUE.—Simoneau and Dion have been awarded the $200,000 contract for an office building for the Quebec Railway, Heat and Power Co., at Quebec. The building must be completed by November.

VANCOUVER, B.C.—The Investors' Guarantee Corporation will erect a fifteen-storey block here at an estimated cost of $500,000.

Vancouver, B.C.—The Hudson's Bay Co. propose to erect a six or eight storey steel building here.

SUDBURY, ONT.—The Casey-Shaw Lumber Co. has obtained a charter.

MONTREAL, QUE.—Canadian Rotary Machine Company, capital stock $600,000. To control Wilhelm von Pittler's system of rotary engines and machines in Canada.

MONTREAL—National Bridge Co., Montreal, Que; capital stock, $1,000,000. To carry on a general bridge building business and to erect the necessary plant.

MUNICIPAL.

PENTICTON, B.C.—By-laws in favor of the installation of a waterworks and electric lighting system were carried recently.

ESQUIMALT, B.C.—The position of general manager of the Esquimalt Waterworks Co. rendered vacant by the death of T. Lubbe will not be filled, the directors undertaking the management of the business.

TORONTO, Ont.—R. Chadwick, the city's bridge engineer, has resigned to accept a position with a New York contracting firm. The Board of Control has appointed Mr. Cousins his successor.

WESTVILLE, N.S.—The new pump has arrived from Toronto. Mr. McIntyre of the Canada Foundry Co. will superintend the erection.

SHERBROOKE, QUE.—The City Council has awarded the contract for power development to Morrow and Beathe, of Peterboro', their tender of $51,220 being the lowest. This amount covers the construction of the dam and power house.

STRATHROY, ONT.—The by-law to raise $6,000 for improvements to the electric light and waterworks systems carried.

ORILLIA, ONT.—The by-law granting the Canada Refining & Smelting Co. certain privileges was carried.

GODERICH, ONT.—The by-law to raise $26,000 by debentures for the building of a storm sewer and referendum towards building new municipal buildings were both carried.

EDMONTON, ALTA.—The City Council provisionally passed debenture by-laws to raise and expend $456,000 on public works. These include $167,000 for a bridge over the Saskatchewan River.

STRATHCONA, ALTA.—Tenders addressed to David Ewing, chief engineer power house, here, for Engine, Boilers and Generators will be received up to March 1st, 1911. Specifications may be had from the city engineer, A. J. McLean.

OTTAWA.—It is announced here that a new steel bridge will be built over the Ottawa river at Temiskaming. The Federal Government will contribute $50,000, Quebec $15,000 and Ontario an amount to be fixed later.

NORTH VANCOUVER, B.C.—The Second Narrows' bridge connecting up the north and south shores of Burrard Inlet with a proposed $1,250,000 traffic and railway bridge is now assured since the electors have voted the necessary funds.

PORTAGE LA PRAIRIE—The city council has appointed a special committee to ascertain the possibility of purchasing a central electric light and gas plant with the view of a municipal owned plant to furnish the city with light and power.

VICTORIA, B.C.—On the recommendation of the water commissioner, the city will pur-

chase 473 Trident water meters of various sizes at a cost of $7,500; 15,000 feet of 12 in., 10,000 feet of 8 in., 35,000 feet of 6 in., 80,000 feet of 4 in. Mannessman's steel tubes at a cost of $80,000; and 460 gate valves of various sizes at an estimated cost of $4,000; and 15 tons of pig lead. These supplies will be used in extensions of the distribution system.

HARRISTON, ONT.—A complete new waterworks system is being installed here.

ST. CATHARINES, ONT.—$180,000 will be spent on the waterworks plant here.

NORTH VANCOUVER, B.C.—The municipality is in the market for $50,000 worth of cast-iron pipe.

PEMBROKE, ONT.—The municipality is in the market for 6,000 feet of 18-inch lapwelded or riveted steel piping.

NELSON, B.C.—The city will install manual training equipment in the schools here. Machine-tool equipment will be required.

RIDGETOWN, ONT.—The plebiscite for waterworks carried.

OWEN SOUND, ONT.—The by-law to rebuild two bridges was carried.

MITCHELL, ONT.—A by-law to run the municipal electric light and waterworks by a commission carried.

HARRISTON, ONT.—The by-law for municipal waterworks carried.

WESTON, ONT.—The by-law for a commission to manage the electric lights and waterworks was carried.

VICTORIA, B.C.—The $150,000 waterworks loan by-law and Sooke Lake by-law both carried.

TORONTO.—The city will apply for legislation to issue debentures to raise $626,544 for a new waterworks intake pipe, a six-foot steel conduit, and the necessary additional pumping mains.

SAULT AU RECOLLET, QUE.—A modern waterworks system will likely be installed here in the near future.

VANCOUVER, B.C.—The ratepayers have authorized the issue of $400,000 of debentures for waterworks extension.

WINNIPEG, MAN.—Tenders will be received up to 11 a.m., on Monday, February 6th, 1911, for the manufacture, delivery and erection complete of two pumping plants each of a capacity of one million imperial gallons per 24 hours. Specifications, forms of tenders may be obtained at the office of the City Engineer, 223 James Avenue, Winnipeg.

BROCKVILLE, ONT.—The municipally owned waterworks system here shows a net surplus for the past year of $2,406.92.

BOWMANVILLE, ONT.—The indebtedness of $19,280 incurred by the late Durham Rubber Co. with this municipality and taken over by the Goodyear Tire Co., of Canada, has been wiped out by the carrying of a by-law granting a bonus of an equal amount. A partial exemption from taxation and a fixed assessment have also been granted the Goodyear Company.

CALGARY, ALTA.—Commissioner Graves estimates that between 25 and 30 miles of water mains will be laid during the present year. The waterworks for 1910 shows a surplus of $3,335.36.

BOWMANVILLE, ONT.—This municipality is considering the installation of waterworks. The proposed source of water supply is from springs seven miles distant. John Lyle, clerk.

Saw Mill and Planing Mill News.

THOROLD, ONT.—The Colonial Wood Products Co. has just erected an addition, 72 by 45 feet, to its mill to provide for additional wet machine capacity, enabling it to increase the output of mechanically ground wood pulp. This company commenced operating in February and the extension referred to has been necessitated by the demand for its ground wood. The plant is operated electrically, having two grinders at present and four wet machines.

CHARLOTTETOWN, P.E.I.—The woodworking steam mills of Barnard Creamer, of Souris, have been totally destroyed by fire. Loss, $8,000. No insurance. Another mill, that of M. F. Schurman and Co., Summerside, was also burned.

LETHBRIDGE, ALTA.—Becker and Yates, with headquarters here, will open a lumber yard, and do a general lumber business.

FORT FRANCES, ONT.—Work has commenced on the new mills of the Shevlin-Clarke Co., here. The erection will be complete by June 1st.

RICHMOND, QUE.—Messier & Desmarais have purchased the Haslett portable saw mill plant at Tronholmville and will remove it to Richmond and make additions to the plant.

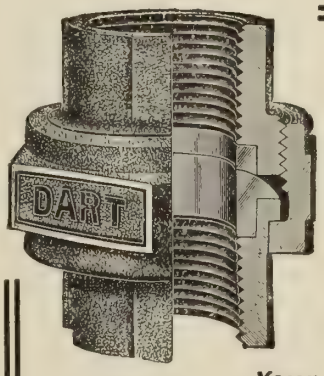
STEWART, B.C.—The Portland Canal Mining Co. are building a new saw mill here.

KINSELLA.—W. H. Kennedy is starting a lumber yard here.

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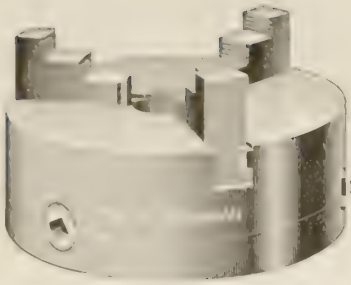
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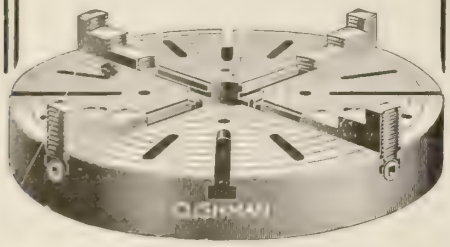
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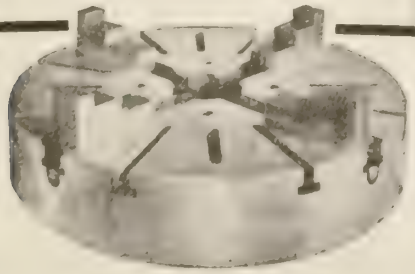
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Ker & Goodwin

Brantford, Canada



CHILLIWACK, B.C.—The Abbotsford Timber and Trading Co. are opening a lumber yard here.

GOLDEN CITY, B.C.—The new mill of the Columbia River Lumber Co., here, has been enclosed and the placing of machinery is being proceeded with. A Fairbanks engine will furnish the power.

FORT GEORGE, B.C.—Three more saw mills will be established in this district and be in readiness for operations in the spring. Two of these will be located on the Nechaco river and the third on the Fraser river, six miles above Fort George.

VANCOUVER, B.C.—The lumber mill and limits of the Salmon River Lumber Co. in Langley municipality have been sold to the Western Lumber and Shingle Co., with head office in Vancouver, for $60,000. The purchasers have placed Mr. Mitchell in charge. It is their intention to operate the mill and possibly install a shingle mill and dry kiln.

RIDGETOWN, ONT.—The Mills of the Howard Cooperage and Lumber Co. will be re-opened, having been closed for two years. Lumber, baskets, veneer and fish boxes will be handled.

DAUPHIN, MAN.—T. A. Burrows of this place will build a large saw mill on the McLeod River, 26 miles west of Wolf Creek. Building operations will be commenced this winter.

CHATHAM, N.B.—J. B. Snowball Co. are altering and extending their large saw mill here. It has been lengthened 32 feet, and a filing room added. Two of the three gang saws will be replaced by an eight-inch band mill, a seven-inch re-saw band, and a twin rotary slabber.

New Westminster, B.C.—Galbraith & Sons intend erecting a saw mill and factory on Lulu Island. The saw mill is to be 40 by 225 by 60 feet. The plant is to be up-to-date, having a large dry lumber shed 45 by 65 feet, dry house 30 by 120 feet, and a loading plant 30 by 40 feet. The mill will be a three-storey one.

CARIBOU, N.B.—S. W. Collins & Son's lumber mill here back of the Vaughn House, was wholly destroyed by fire recently. The loss was $7,000, insurance $1,000. This mill may not be rebuilt, as a mill in that spot is said to be not a very profitable proposition.

OWEN SOUND, ONT.—The Galbraith-Bumstead syndicate are rushing the work on their new planing mill, sash and door factory here. Approved mill construction is being used.

LETHBRIDGE, ALTA.—The Farmers Lumber Co. are building a lumber yard here.

General Manufacturing

MOOSE JAW, SASK.—The Western Manufacturing Co., Regina, has purchased the Saskatchewan Sash and Door Co., here, and will make additions to the plant.

ORILLIA, ONT.—The Canada Keg & Barrel Co. will commence the erection of factory buildings here in the early spring. A site of 5 acres has been granted by the town.

BERLIN, ONT.—The L. McBrine Co., trunk manufacturers, and the Art Glass Co., are each planning to construct large additions to their present factories. In addition, the Felt Boot and Rubber Manufacturers will build a box factory for their own use.

REGINA, SASK.—The Massey-Harris Co. are building a track warehouse here, 96x48 feet and two storeys high. They will also build track warehouses at Swift Current and Arcola.

REGINA, SASK.—The Sawyer-Massey Co., of Hamilton, will erect a warehouse and distributing agency here. The construction will be of brick and steel throughout with concrete floors. The building is to be steam-heated.

SARNIA, ONT.—H. Diver has purchased a site from the Cleveland-Sarnia Saw Mills Co., and will commence the establishment of a new industry here. The new firm will manufacture doors, especially of the better class, veneered and fancy hardwood. The main building will be 80x200 feet, two storeys in height, and of reinforced concrete. There will be a storage building of 20x200 feet, dry kilns of 60x60 feet, and a building for the steam power plant of 40x80 feet. Work on the erection of the new structure will be commenced forthwith.

RIDGETOWN, ONT.—T. G. Johnston has taken an interest in the Leitch basket works. A new veneer machine, rip saw, new boiler and engine will be placed in the factory.

LONDON, ONT.—A large knitting concern from the United States has leased a building here and will commence operations in the near future.

OTTAWA, ONT.—The Beaver Board Co., of Buffalo, N.Y., has purchased land in Ottawa upon which to erect a factory for the making

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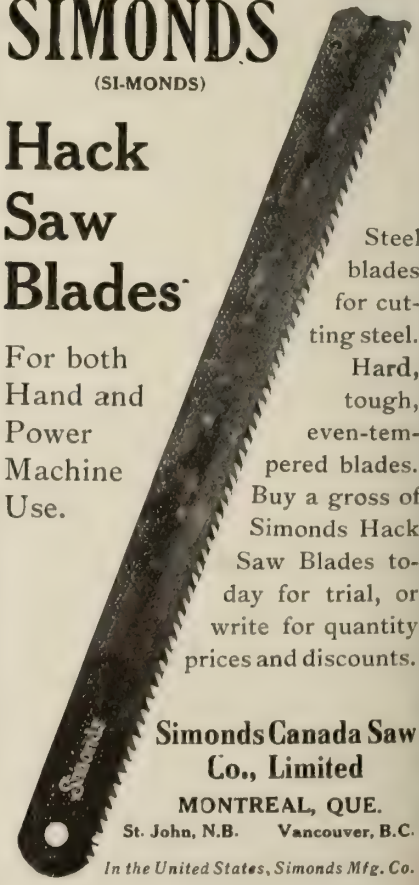
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of fireproof boarding to take the place of lath and plaster.

MONTREAL, QUE.—The pulp and paper mills to be established by Price Bros. & Co., on the Riviere au Sable, and for the building of which $5,000,000 has recently been raised by the sale of the company's bonds in London, are to be ready for operation by June, 1912. The new industries are expected to bring into existence at that point a town of 4,000 or 5,000 inhabitants. A water power development that can be depended on to maintain 14,000 h.p. will be begun as soon as possible.

AMHERST, N.S.—The Amherst Boot & Shoe Co., whose plant turns out 1,000 pairs a day, is doubling its manufacturing capacity.

Building Notes.

VANCOUVER, B.C.—Extensive alterations will be commenced in the spring on the abattoir and packing plant of P. Burns & Co. About $200,000 will be expended.

VANCOUVER, B.C.—Mr. Lester will erect a $100,000 six-storey building here in the spring. Up-to-date equipment will be a feature of the building throughout.

PRINCE RUPERT, B.C.—The Pacific Construction Co., of Victoria, B.C., has been awarded the contract for the marine department depot here. The contract price is $150,000.

HAMILTON, ONT. — The International Harvester Co. have let a contract for a new office at their plant to G. E. Mills. Cost, $40,000.

CALGARY, ALTA.—The C.P.R. will erect a big hotel here.

ST. CATHARINES, ONT.—The city has decided to give 35 acres of free land to the Steel and Radiation, Limited. The company will spend $50,000 on buildings.

REGINA, SASK.—Hand Bros. & Nellermoe Co., of Winnipeg, will erect a $50,000 implement warehouse here. The headquarters of the firm will be moved here.

REGINA, SASK.—The Toronto Type Foundry Co., of Toronto, are preparing plans for a $20,000 warehouse. It will have steam heating, plumbing and an electric hoist.

TORONT, ONT.—The C.P.R. will erect at the corner of King and Yonge streets, a sixteen storey building, costing over $1,000,000. It will be of steel, faced with glazed terra cotta and will be one of the finest office buildings in the world.

SASKATOON, ALTA.—The Canadian Fairbanks Co. will erect a block here on Twenty-Third Street.

SASKATOON, ALTA.—The International Harvester Co. have a scheme in view which will extend their premises considerably. It is also stated that the J. I. Case Co. will build in this city.

SASKATOON, ALTA.—The American-Abell Engine and Thresher Co. also intend locating here. They have erected offices and a warehouse opposite the C.P.R. depot.

SASKATOON, ALTA.—The Hart-Parr Co., of Charles City, Iowa, manufacturers of oil and gasoline traction plow engines have located offices here as headquarters for Northern Saskatchewan and Northern Manitoba.

MONTREAL, QUE.—The Engineers' Club will make extensive improvements to their clubhouse here. The plans call for an expenditure of $100,000.

MEDICINE HAT, ALTA.—The Alberta Linseed Oil and Paint Co. will erect a plant here. It will be fireproof, of brick and cement, excepting elevators which shall be of the usual material.

TORONTO, ONT.—The Central Y.M.C.A. will erect a new building here at a cost of from $300,000 to $400,000. It will be of fireproof construction, with a steel frame, brick walls and fireproof floors and partitions.

EDMONTON, ALTA.—MacDougall & Secord contemplate the erection of a ten-storey business block on the corner of First and Jasper Streets. The date of construction has not been decided upon.

EDMONTON, ALTA.—Architect H. A. Magoon is preparing plans for a five-storey hotel to be built by J. B. Mercer, on present site of Grand Central Hotel. Cost about $100,000.

OTTAWA, ONT.—A new agricultural implement and machinery hall at the exhibition grounds will be built this year at a cost of $75,000.

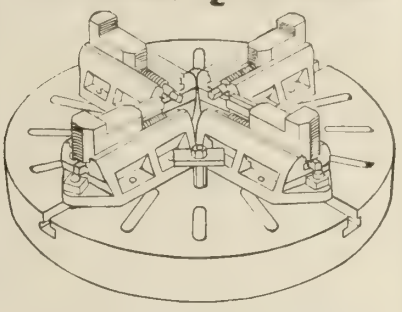
REGINA, SASK.—Plans are ready for the new Donahue Block to be erected this spring on Eleventh Ave., at a cost of $100,000. It will be modern in every respect.

ORILLIA, ONT. -The Canada Refining and Smelting Co. will extend its plant here.

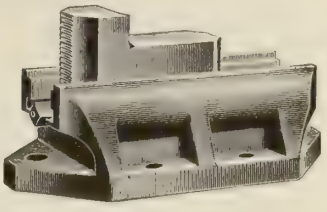
PRINCETON, B.C.—The British Columbia Portland Cement Co. is building a large plant here.

ST. JOHN, N.B.—The Partington Pulp and

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Paper Co. will make extensive improvements to its plant here.

CHATHAM, ONT.—The Western Bridge and Equipment Co. will build a large factory here.

PORT ARTHUR, ONT.—A new armory will be erected here in the spring at a cost of $125,000.

OTTAWA, ONT.—Tenders will soon be called on the new departmental block to be located here. The total cost will likely be about three and a half millions and big contractors all over the Dominion are making enquiries with a view of tendering.

VICTORIA, B.C.—L. W. Hargreaves has completed the plans for a five-storey hotel to be erected here. The building will be of reinforced concrete, and have elevators and a steam heating system.

SYDNEY, C.B.—R. L. Johnston, of St. John, has about completed arrangements for a large rolling mill plant here. New York capitalists are interested. He took options on two sites, and definite announcement of plans will be made later. The new company will construct a very large plant, having completed arrangements with the Dominion Steel Corporation for stock. They have secured from the Town Council a bonus of $50,000, with nominal water and tax.

REVELSTOKE, B.C.—The Dominion Saw Mills and Lumber Co., of Three Valley, and Revelstoke, B.C. have let a contract for the erection of a three-storey office building on Victoria Ave., here.

THREE RIVERS, QUE.—The Fres Falls Co. is pushing the construction of its pulp and paper mills at Cap de Madeline, near here.

PORT HOPE, ONT.—The Standard Ideal Co., manufacturers of enameled sanitary ware, are spending $100,000 on new construction.

WALKERVILLE, ONT.—The Canadian Bridge Co. is making a $100,000 addition to its works.

MERRITTON, ONT.—An addition of 40 x 60 ft. is being made to the works of the Wheel Company here.

PETERBOROUGH, ONT.—The addition the Canadian General Electric Co. is making to its works at Peterborough will be 125 x 274 ft. It is to be of brick and steel, and is to cost $100,000.

New Companies.

MONTREAL, QUE.—The Central Canada Iron & Steel Corporation capitalized at $15,000,000 has been incorporated.

VICTORIA, B.C.—The Western Laundry Machinery Co. has been registered.

MOOSE JAW, SASK.—The Moose Jaw Implement Co. has been incorporated to deal in farm implements. The firm is composed of A. H. Gamble, T. J. McCammon and W. C. Yeo, all of this city.

Trades Notes.

THREE RIVERS, P.Q.—The contract for the pulp machine for the Wayakamite Paper Co. has been let to the Jeffrey Mfg. Co., Montreal.

The Chapman Double Ball Bearing Co., Toronto, are now manufacturing ball bearings for the Tudhope, Reo and Ford Motor Companies. They have received the orders for bearings for the Canadian National Acme Mfg. Co. and Crown Laundry, Montreal, and new plants of Watson and Smith and Nasmith in Toronto.

WELLAND, ONT.—The Annual meeting of the Robertson Machinery Co. was held Jan. 13, when the following officers were elected: President, D. D. Hooker; vice-president, Blake L. Booth; secretary, J. H. Crow; directors, the above officers and Alex. Robertson and G. W. Sutherland.

TORONTO, ONT.—At the annual meeting of the shareholders of the Johnston Harvester Company, held at the head offices of the company in Batavia, N.Y., three directors of the Massey-Harris Company, viz.: Senator L. Melvin-Jones, Joseph N. Shenstone and Thomas Findley, were elected as directors. At a subsequent meeting of the directors, Senator L. Melvin-Jones was made president of the company, G. A. Farrall, vice president and general manager, L. D. Collins, treasurer and assistant general manager, and E. Atwater, secretary. Mr. Farrall, Mr. Collins and Mr. Atwater are residents of Batavia and are continuing in the active management of the company.

GALT, ONT.—The Stevens Co., manufacturers of machine tools have recently taken the agency for the Gronkvist Drill Chucks made in Katrineholm, Sweden.

Welland Board of Trade.

At the annual meeting of the Welland Board of Trade the following officers were elected:—David Ross, pres.; T. D. Cowper, vice-pres.; J. D. Payne, secretary; A. H. M. Hay, manager Bank of Nova Scotia, treasurer;

T. J. Dillon and F. A. Lount, auditors; B. J. McCormick, industrial commissioner; council, F. N. McConnell, H. F. Stoddard, H. L. Hatt, L. B. Duff, G. C. Brown and G. W. Hickey.

Canada Car & Foundry Co. Acquires Ontario Iron and Steel Plant.

Arrangements have been completed for the transfer of the Ontario Iron & Steel plant in Welland to the Canadian Car & Foundry Co., Montreal, which is a Canadian branch of the American Iron & Steel Co. The Ontario Iron and Steel Co. are completing a new $20,000 office building in Welland and additional improvements will be made. The Page-Hersey Works, managed by Mr. Mosley, is not included in the deal.

Dominion Iron & Steel Co. Coke Ovens.

Completing touches are being put upon the installation of Otto by-product coke ovens at the plant of the Dominion Iron & Steel Co., Sydney, N.S., and operations will be inaugurated within several months. The new plant consists of 120 ovens of the standard Otto type with a holding capacity of 13 tons of coal each. The product will be devoted to the requirements of the group of blast furnaces of the company. This is the second insallation of Otto ovens by the Dominion Iron and Steel Company, a plant of this type having been put in service there some years ago. Construction work on the present installation has been under way for the past 13 months and the completion of the plant within this period is regarded as a very satisfactory achievement considering the weather conditions that are confronted there by reason of the geographical location. The United Gas & Coke Co., Whitehall building, New York City, which controls the Otto rights, is building the plant.

Taylor & Arnold Open Winnipeg Office.

Taylor & Arnold, railway material and supplies, Montreal, have opened an office in the Scott Block, Main Street, Winnipeg, with G. C. Walker in charge, to look after all the company's western interest.

Incorporation of Robert W. Hunt & Co.

Robert W. Hunt and Co. have been incorporated under the Dominion Companies Act, with a capital of $50,000 and office at Montreal, to carry on the business, in all its branches, of civil, mechanical, mining and electrical engineers, analysts, metallurgists, surveyors, assayers, examiners and inspectors, to take over the Canadian business of Robert W. Hunt and Co., and also to acquire the business and carry out the contracts of the Standard Inspection Bureau.

Canada Motors, Limited.

Arrangements have been completed for the establishment of a new industry in Galt, known as Canada Motors. It will have a capital of $250,000. The following officers have been elected: president, George Dobbie; vice-president, A. M. Edwards; secretary, C. Jansen; managing director, D. R. Perry; treasurer, E. J. Getty. These, with Dr. MacKendrick, F. Stewart Scott, Dr. T. F. Campbell, all of Galt, and A. N. W. Clare, of Preston, will form the board of directors. The company have engaged temporary quarters until permanent buildings are erected.

Hamilton Facing Mill Co. Calendar.

Following their usual custom, the Hamilton Facing Mill Co., Hamilton, foundry outfitters and manufacturers of foundry facings and supplies are mailing to their friends a calendar for office or home decoration. It contains a reproduction of the famous painting "The Girl in Blue," by Wm. Thorne. The whole painting is a harmony of eloquent color for which the paintings of Wm. Thorne are notable.

Massey-Harris Co. Busy.

The Massey-Harris Co., Toronto, who have been working overtime for about two months have started a night gang and will be in full operation night and day.

New Bridge Co.

The National Bridge Co., has been incorporated with a capital of $1,000,000 and $3,000,000 bond issue. A large plant is being constructed at Longue Pointe, near Montreal. The steel work is up and the company will soon be operating. The new organization will have as its president, J. N. Greenshields; as vice-president, William Lyall, and the directorate will consist of Hon. Robt. Mackay, H. W. Beauclerk and B. M. Shepherd.

Large Steel Plant Near Vancouver.

Three hundred acres of land on the south side of the Fraser River, directly opposite Annacis Island, have just been secured by the Canadian-incorporated subsidiary company to the Western Steel Corporation as a site for a steel plant. The erection of huge blast furnaces and the expenditure of close on $2,000,000 in the construction of buildings and wharves and the installation of modern machinery is contemplated. In order to provide room for a large industrial city tributary to the steel works, private capitalists connected with the company have taken options on over 1,500 acres of adjoining property, and much of this is now being purchased outright. The location of the site which possesses over 1,700 feet of waterfrontage along the Fraser River with approaches both by land and water, has already been approved of by James A. Moore, president of the Western Steel Corporation, now operating a steel plant at Irondale, Wash. Among the Vancouver men interested in the proposition are R. P. McLennan, G. M. Gibbs, and S. G. Faulkner, all directors of the Canadian subsidiary company. Mr. McLennan confirmed the report that the purchase of 300 acres for a steel plant site had been approved by Mr. Moore.

Williams & Wilson, Montreal.

Williams & Wilson, Montreal, are turned into a joint stock company to take over the present machinery business of the firm. The capital is $200,000, and the incorporators are A. R. Williams, Toronto; F. C. Wilson, W. A. Wilson, M. B. Bronsbetter and E. Kingsland, salesman, of Montreal.

CATALOGUES.

Calendar.—Mussens, Montreal, are sending out a calendar, the figures occupying a space of 19 x 16 inches. They can, therefore, be seen from a long distance. Above the figures on the sheet for each month, are illustrations of machinery for which Mussens are selling agents, including machine tools, engines, air compressors, railroad and contractors' outfits, etc.

Friction Clutches.—The Carlyle Johnson Machine Co., Manchester, Conn., Catalogue "E," 1911, 35 pages, 4½ inches by 7 inches. An issue of 25,000. The catalogue is enclosed in a handsome cover of two-toned blue, with a clutch cut and company monogram embossed thereon, and is filled with attractive illustrations showing the Johnson Clutch, factory views, etc. The inside pages have an attractive blue border to correspond with the blue cover, this border being made up of reduced cuts of Johnson Friction Clutches, with the headings at the top, of the company name and address, as always used in their trade paper advertising. This catalogue is larger and more complete than previous ones, and deals almost exclusively with the driving of machinery through friction clutches, special attention being paid to the driving of machinery from line shafting, thus eliminating cross belting, countershafting, etc. There is special mention made of clutches for cut-off coupling work for use in connection with marine motors, as a one-way clutch for which work this type of clutch is particularly adapted. The lists are very complete, extending to clutch parts, which are numbered to correspond to the numbers indicating the parts on sectional views. Copies will be sent free to interested parties.

Calendar.—The B. Greening Wire Co. have issued a calendar for 1911 containing a bird's-eye view of the large plant in Hamilton, Ont. Half-tones are also given of Nathaniel Greening, who established the plant in Warrington, 1799; Benjamin Greening, who established the plant in Hamilton, 1859; S. O. Greening, president, 1877, and H. B. Greening, managing director. It is of interest to note that there are here represented four generations.

Machine Tools.—Eleventh addition of booklet, 28 pages, of lathes, planers, shapers and drills issued by the American Tool Works Co., Cincinnati.

Smooth-on Iron Paint.—12 page booklet from the Smooth-on Mfg. Co., 572 Communipaw Ave., Jersey City, N.J.

Browning Ditchers.—Descriptive catalogue, 9 x 12 inches, 32 pages from the Browning Engineering Co., Cleveland, describes their ditchers, giving dimensions of the devices and equipment such as buckets, booms, etc. The various operations are illustrated as well as their many uses such as wrecking cranes, locomotive cranes, electro-magnets, etc.

Gear Testing Machine.—Circular 821 from Adams Co., Dubuque, Iowa, describing the Farwell Gear Testing Machine.

Boiler Makers' Tools.—J. Faessler Mfg. Co., Moberly, Mo., have issued a neat catalogue No. 27, of 32 pages on coated stock, containing illustrations and descriptions of roller flue expanders, sectional beading expanders, flue cutters, patch bolt countersinking tools, etc.

Tapes and Rules.—The Lufkin Rule Co., Windsor, have issued catalogue No. 8, containing 96 pages, 6 x 9 inches. It is printed on coated paper, neatly bound and contains descriptions with illustrations of all styles of steel tapes, rules, squares, board sticks, etc. All classes of mechanics rules are described,

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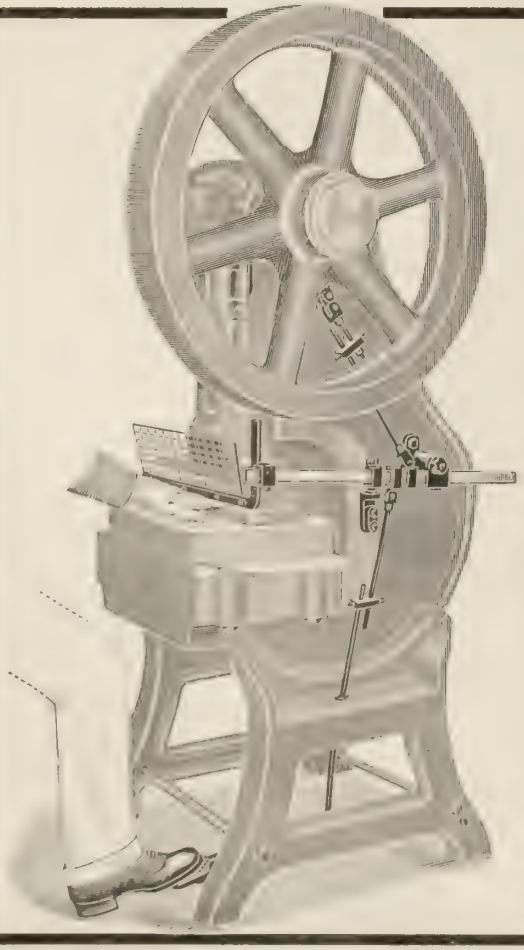
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Chains.—Circular No. 7, from Jones & Glassco, Montreal agents for Renold block and roller chains.

Calendar.—For 1911, from American Tool Works Co., Cincinnati. At the top of the sheet, for each month is a half-tone of one of the various types of machine tools manufactured by this company.

Time Recorders.—Sample cards and sheets from W. A. Wood, 40 St. George St., Montreal, manufacturers of "Globe" time recorders.

Calendar.—The I.C.R. have issued a 1911 calendar. The emblematic moose head which is usually a feature of the I.C.R. literature and calendars, appears prominently on the calendar.

Cranes.—Catalogue 82 from Whiting Foundry Equipment Co., Harvey, Ill., 40 pages. The features of Whitney Standard Cranes are shown with a large number of typical installations. These include railroad shops, machine shops generally, power plants, etc. The names of some of the principal customers are also given.

Cranes.—Catalogue No. 25 of 56 pages from the Northern Engineering Works, Detroit, Mich. Several types of cranes are described and illustrated. Installations in machine shops, foundries, yards, car shops, power plants, etc., are given, showing many applications of the various types of cranes.

Book Review.

A Pocketbook of Mechanical Engineering.—By Charles M. Sames, B.Sc. Fourth edition. Bound in flexible leather. Size, 4 x 6⅝ in.; pages, 220; 42 illustrations. Price, $2. Published by the author, 542 Bramhall Avenue, Jersey City, N.J. This book contains a collection of tables, data, formulas and examples, comprising the greater part of the reference information usually required by mechanical engineers and students, condensed into a volume, the dimensions of which are small enough to e conveniently carried in the pocket. In preparing this last edition, new matter has been incorporated to bring the work thoroughly up-to-date. Among these added subjects are new alloys and alloy steels, critical speed of shafts, new steam tables, formulas dealing with saturated and superheated steam, steam turbines, electric drive and the power required for machine tools and cooling towers. Besides these subjects new data have been added at a number of points in the text. The book is a useful one to draftsmen and mechanical men generally.

Shop Kinks. By Robert Grimshaw. Bound in cloth. Size 6 x 7½ in. Pages 393; illustrations 224. Published by the Norman W. Henley Publishing Co., 132 Nassau Street, New York. Price $2.50. This is the fifth edition of a book that shows special ways of doing work, as it is done in a number of leading shops in America and Europe. The work is the outcome of a notebook started by the author about 30 years ago and contains items written by the author and others for technical journals and also material gathered from visits to shops or based on data contributed by leading machine tool builders and users. As far as possible the effort has been made to group items of the same nature together, and the finding of them is rendered easy by an extensive alphabetical index.

Freight Train Resistance: Its Relation to Car Weight.—By Edward C. Schmidt, has just been issued as Bulletin No. 43 of the Engineering Experiment Station of the University of Illinois. This bulletin presents the results of tests made upon freight trains to determine their resistance. The results show that the average weight of the cars composing the trains exerts upon train resistance an even greater influence than is exerted by variations in train speed. Copies of Bulletin No. 43 may be obtained gratis upon application to W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Illinois.



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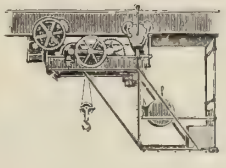
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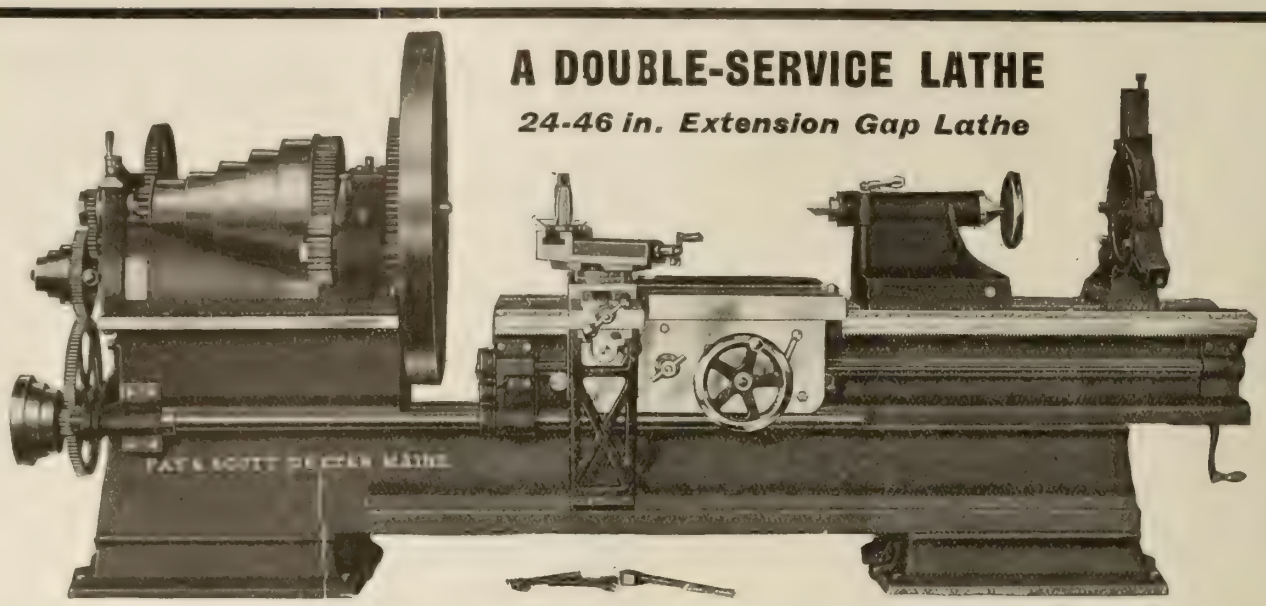
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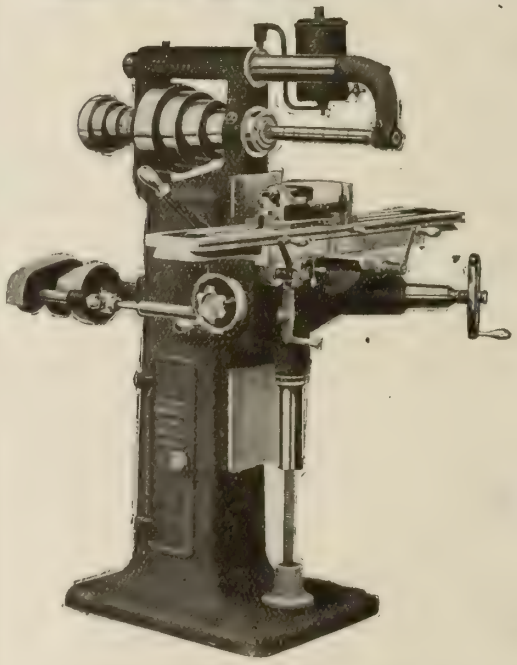
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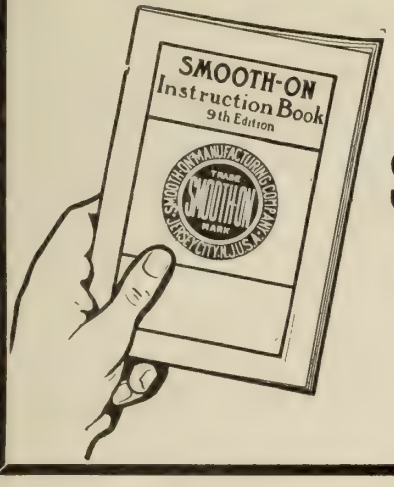
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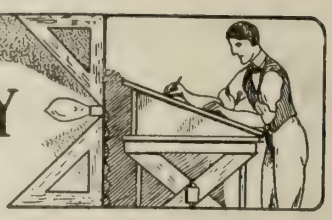
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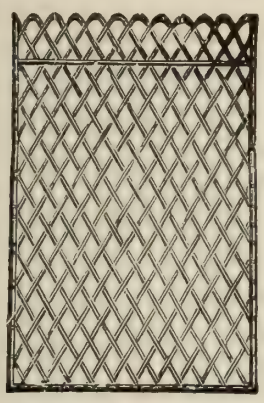
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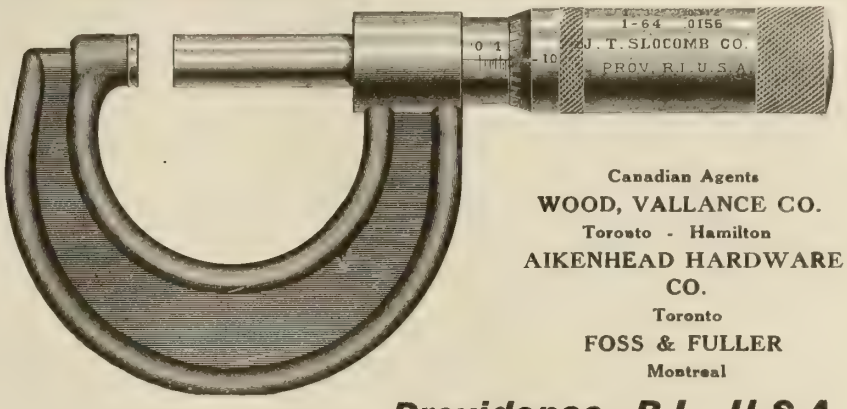
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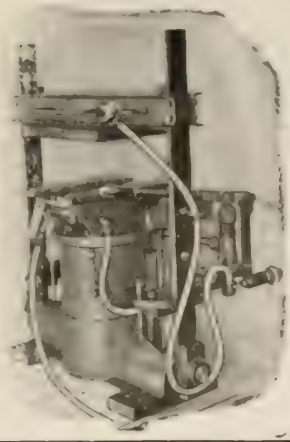
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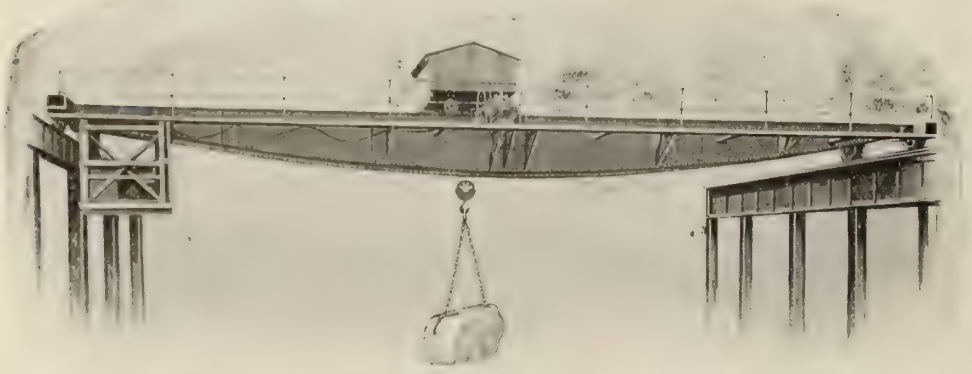


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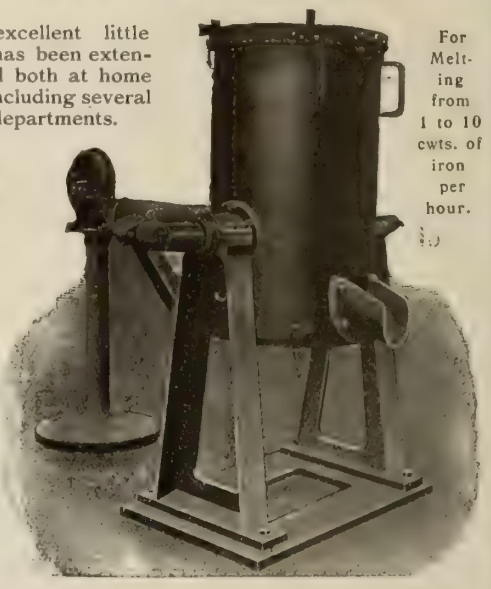
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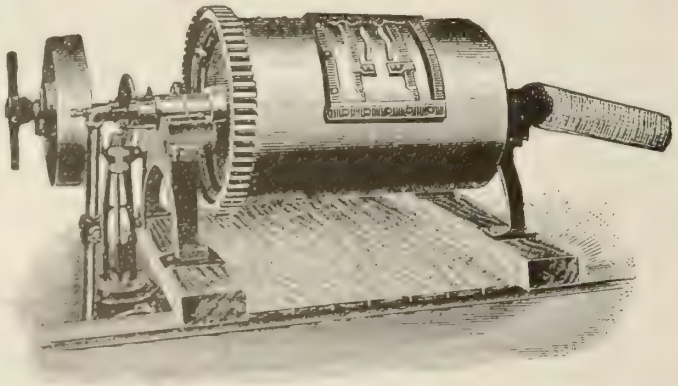
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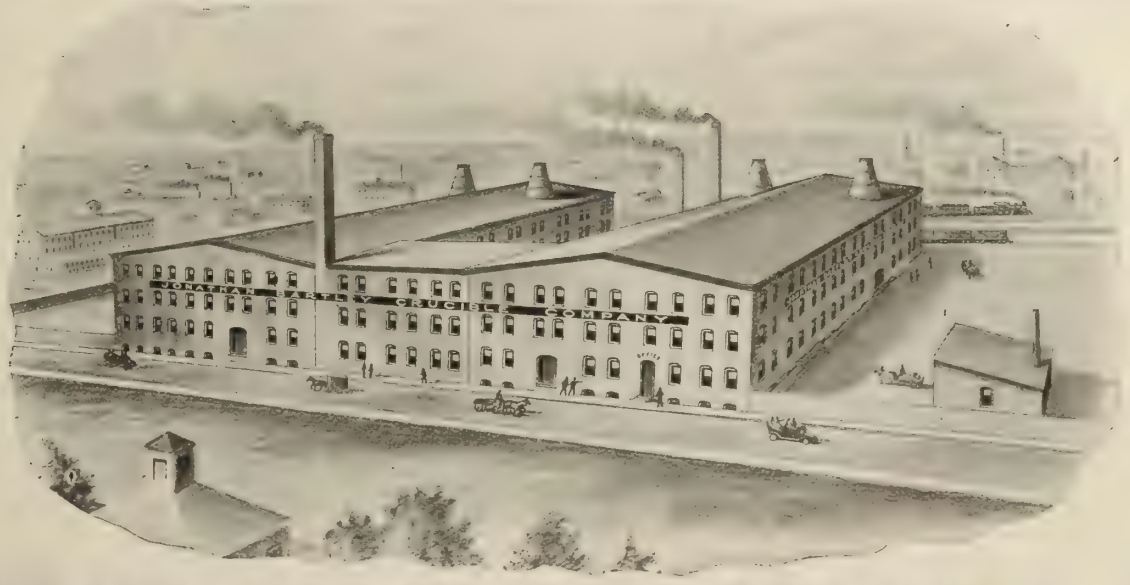
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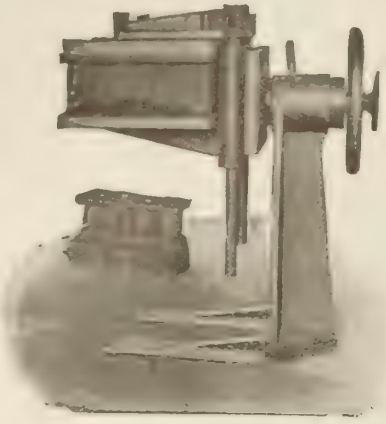
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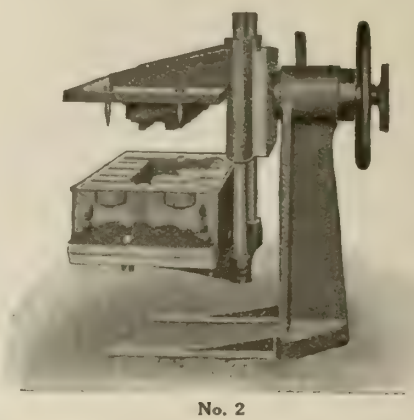
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It is perfectly balanced, requiring no counter-balancing mechanism, as centre of gravity is centre of rotation.



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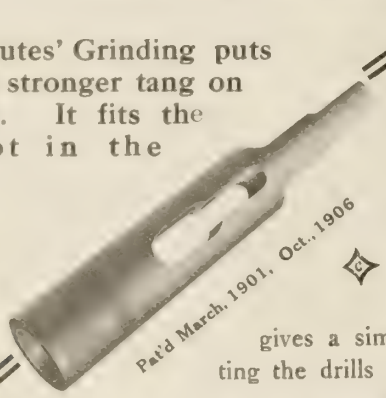
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will do your work as you want it done.

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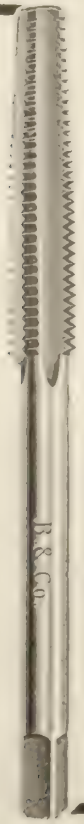
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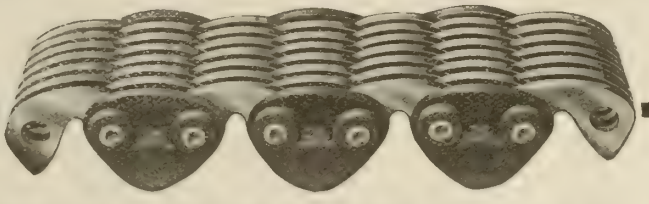
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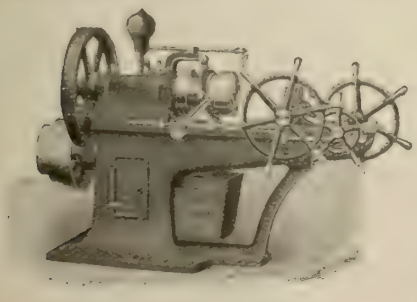
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Milling Machines, Universal.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Garvin Machine Co., New York
Schuchardt & Schutte, New York

Milling Machines, Bench.

Schuchardt & Schutte, New York

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Waterous Engine Works Co., Brantford

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Canadian Westinghouse Co., Hamilton
Vandervoort & Nicholls, Toronto

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The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst, N.S.
Waterous Engine Co., Brantford.

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Brown & Sharpe Mfg. Co., Providence, R.I.
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York,
Pratt & Whitney, Hartford, Conn.

Milling Machines, all kinds.

Canadian Yeates Gordon Co., Hamilton

Milling Machines, Horizontal

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John Bertram & Sons Co., Dundas, Ont.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Massey Limited, Montreal
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.
Brown & Sharpe Mfg. Co., Providence
John Bertram & Sons Co., Dundas

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Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Massey Limited, Montreal
Niles-Bement-Pond Co., New York.

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Kearney & Trecker Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Massey Limited, Montreal
Niles-Bement-Pond Co., New York.

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Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
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National Machinery Co., Tiffin, Ohio

Nut Machines (Hot.)

National Machinery Co., Tiffin, Ohio

Nut Facing and Bolt Shaving Machines.

Canadian Yeates Gordon Co., Hamilton
Garvin Machine Co., New York
National Machinery Co., Tiffin, Ohio

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Garvin Machine Co., New York
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National Machinery Co., Tiffin, Ohio.

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Rupert G. Bruce Co., Ltd., Toronto

Oil Separators.

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Standard Engineering Co., Toronto

Oil Stones.

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Carborundum Co., Niagara Falls N.Y.
Whiting Foundry Equipment Co., Harvey Ill.

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Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop.

Cleveland Wire Spring Co., Cleveland

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Hamilton Pattern Works, Hamilton.

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Tallman Brass & Metal Co., Hamilton

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London Mach. Tool Co., Hamilton, Ont.
Massey Limited, Montreal.
Niles-Bement-Pond Co., New York.
Williams Tool Co., Erie, Pa.

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R. McDougall Co., Galt
Garvin Machine Co., New York

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Lancashire Dynamo and Motor Co., Ltd., Toronto

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Armstrong Tool Bros. Co., Chicago

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Gardner, Robt. & Son, Montreal
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
Massey Limited, Montreal
New Haven Mfg. Co., New Haven, Conn.
Niles Bement Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

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London Mach. Tool Co., Hamilton, Ont.
Niles Bement Pond Co., New York

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Schuchardt & Schutte, New York

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Holden Co., Montreal
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Mussens Limited, Montreal

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Waterous Engine Co., Brantford.

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The Canadian Fairbanks Co., Montreal
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Canadian Yeates Gordon Co., Hamilton
Darling Bros., Ltd., Montreal
General Supply Co. of Canada, Ottawa.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal, Que.
The John Inglis Co., Ltd., Toronto
London Mach. Tool Co., Hamilton, Ont.
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London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
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Bertrams Limited, Edinburgh, Scotland
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Niles-Bement-Pond Co., New York.

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Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

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Butterfield & Co., Rock Island, Que.
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Morse Twist Drill and Machine Co., New Bedford

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Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Reamers, High Speed

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Morse Twist Drill and Machine Co., New Bedford

Reamer Fluting Machines.

Garvin Machine Co., New York

Reamers, Locomotive.

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The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

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Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Reamers, Pneumatic

Independent Pneumatic Tool Co., Chicago.

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Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland

Reamers, Steel Taper.

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Cleveland Twist Drill Co., Cleveland
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Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
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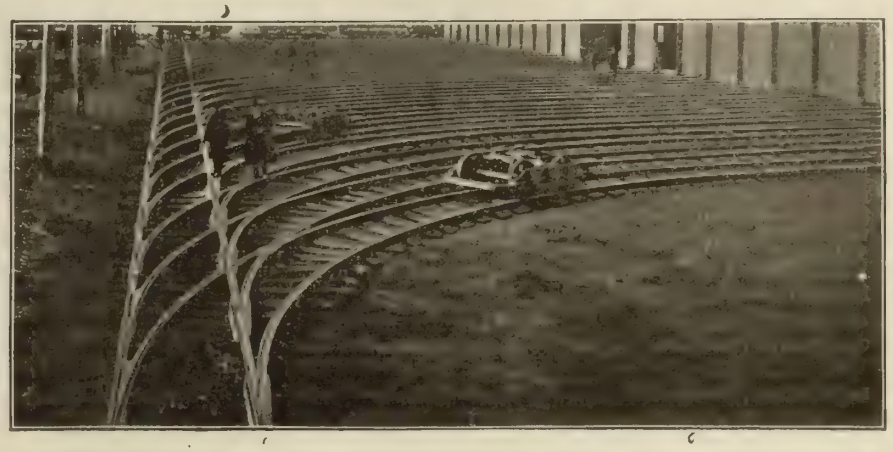
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Pratt & Whitney Co., Hartford, Conn.
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Schuchardt & Schutte, New York

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London Mach. Tool Co., Hamilton, Ont.
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Russell Machine Co., St. Catharines, Ont
Waterous Engine Co., Brantford.

Spike Machines.

The Smart-Turner Machine Co., Hamilton

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Garvin Machine Co., New York

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Cleveland Wire Spring Co., Cleveland

Springs, Machinery.

Cleveland Wire Spring Co., Cleveland

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Garvin Machine Co., New York

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Sheldon's Limited, Galt.
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Schuchardt & Schutte, New York

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Sheldon's Limited, Galt.

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Canadian Fairbanks Co., Montreal.
Canadian Yeates Gordon Co., Hamilton
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Jessop, Wm., & Sons, Sheffield, Eng.
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Stocks, Pipe.

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Butterfield & Co., Rock Island, Que.

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London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.
L. S. Starrett Co., Athol, Mass.

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Geometric Tool Co, New Haven, Conn.

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The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
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Toronto Testing Laboratory, Toronto

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Garvin Machine Co., New York

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Toronto Plate Glass Importing Co., Toronto.

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W. A. Wood, Montreal

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Keystone Mfg. Co., Buffalo
Pratt & Whitney Co., Hartford, Conn.

Tool Posts, Lathe.

Armstrong Bros. Tool Co., Chicago

Tool Steel.

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Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Alexander Gibb, Montreal.
Wm. Jessop, Sons & Co., Toronto.

Tools, Electrical.

Holden Co., Montreal
United States Electric Tool Co., Cincinnati.

Tools, Lathe, Planer and Slotter.

Armstrong Bros. Tool Co, Chicago

Torches, Steel.

Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
Stevens, F. B., Detroit, Mich.

Track Tools

The Canadian Fairbanks Co., Montreal
Montreal Steel Works, Montreal

Transformers and Convertors

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton
Hall Engineering Works, Montreal, Que
T. & H. Electric Co., Hamilton

Transmission Machinery.

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Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
Mussens Limited Montreal.
Positive Clutch & Pulley Works, Toronto
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

Trolley Wheels.

Tallman Brass & Metal Co., Hamilton
Lumen Bearing Co., Toronto
John Millen & Son, Montreal

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Montreal Steel Works, Montreal

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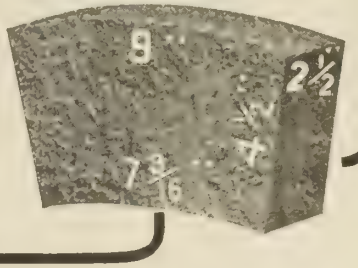
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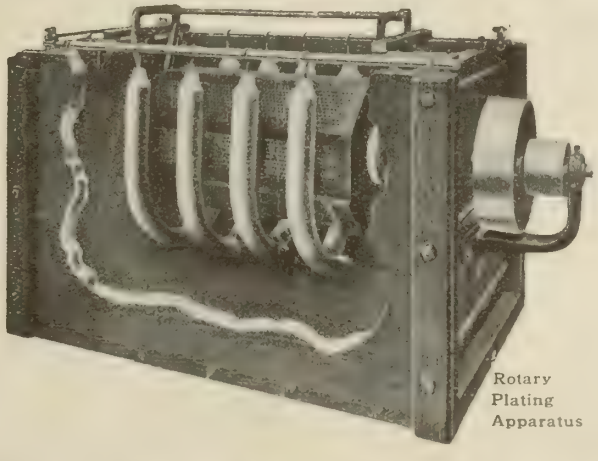
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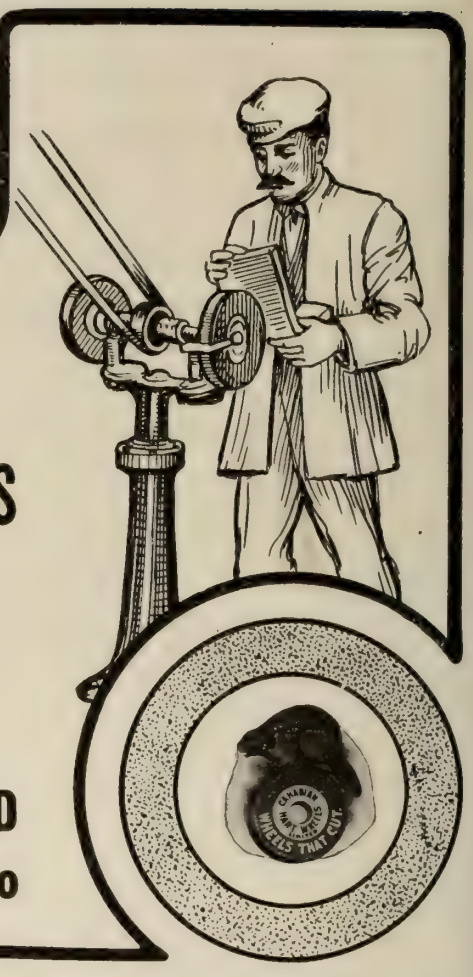
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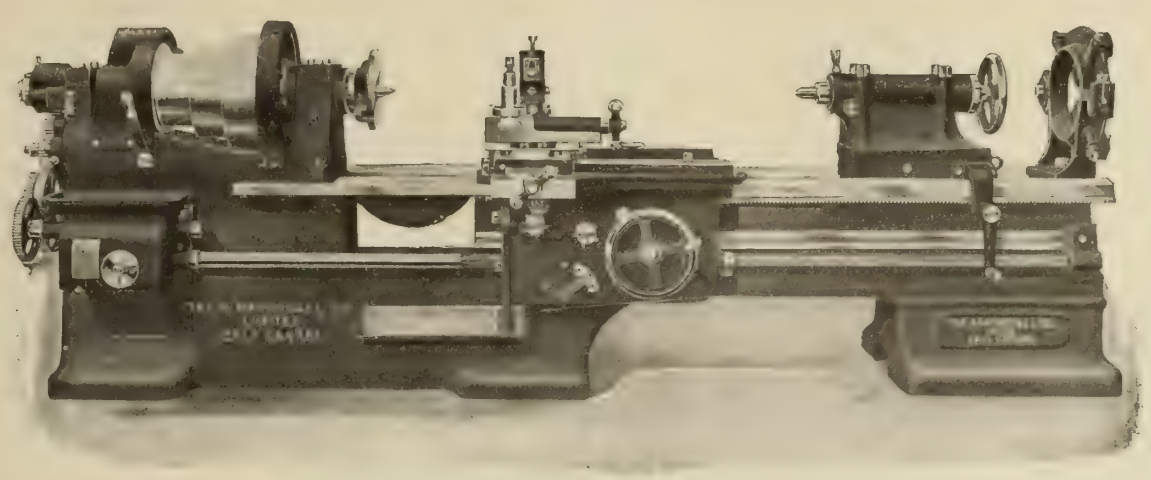
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WILL INCREASE YOUR PROFITS



INCREASED speed and efficiency means increased profits. This new gap lathe increases speed and efficiency for the following reasons:—The extra strong gap gives absolute rigidity. The construction of the carriage and apron is such that they will not spring under the most severe strain. Headstock will not chatter. Tailstock fitted with quick acting locking device. Tailstock adjusted from the top. Friction safety feeds give quick changes of thread. Eighteen distinct spindle speeds by double back gears. Specially graduated dial on the gear box. Adjustable to thousandth of an inch both ways by graduated compound rest. Ring oilers give perfect self lubrication. Greatest strength, accuracy, solidity and wear. Full equipment with each lathe.

Headstock construction prevents chattering, and deep oil chambers fitted with ring oilers make spindles and bearings self-oiling and always well lubricated.

Tailstock of a special type, and sleeve is clamped by a quick acting locking device. Tailstock is secured to bed by bolts adjusted from the top where they are easily accessible.

Bed, non-springing and webbed, and braced to secure rigidity.

Gap, vibration absolutely prevented by use of brace supports to carriage.

Spindle, high carbon hammered steel in solid chilled cast iron bearings, accurately fitted and self oiling.

Carriage and Apron, non-springing under severest strain, full "V" bearings and flat bearings in addition on front ways.

Double Back Gears give eighteen distinct spindle speeds, suiting lathe to work on widely different diameters.

Compound Rest, with graduated base, accurately fitted taper gibs, end adjusted. Screws in both rest and cross slide read to thousandths.

Friction, Safety Feeds, screw and rod feeds cannot be both engaged at the same time. Quick changes of 1¼, 2½ and 5 times thread being cut.

Gears and Racks, cut from solid and steel where necessary.

Screw Cutting, full range of commercial threads provided for.

Equipment, Compound rest, steady rest, follow rest, large and small face plates, wrenches, two-speed, friction countershaft furnished with each lathe.

Accuracy, Strength, Solidity, Wear. These are the paramount features behind all McDougall Machines. Made **to meet extreme demands.**

Write for Particulars

The R. McDougall Co., Ltd.

GALT, ONTARIO

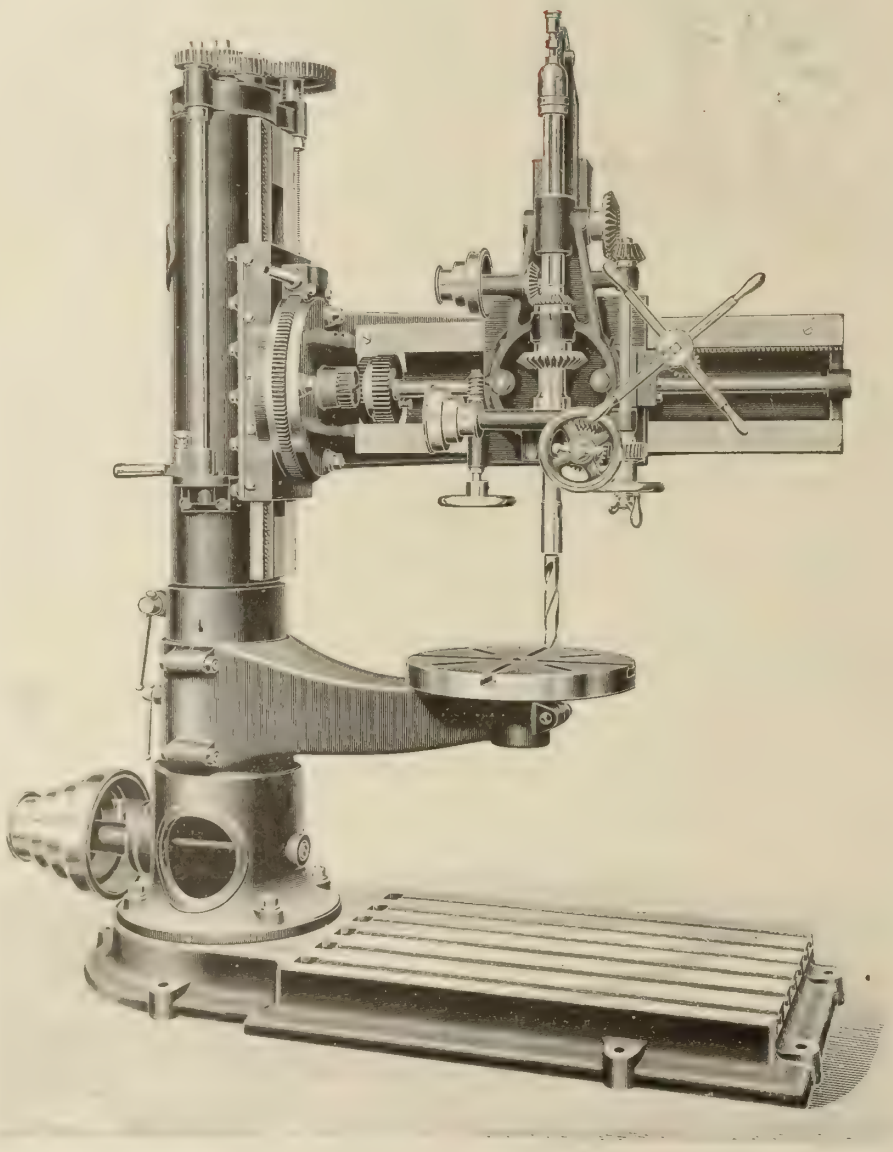
Canadian Fairbanks Company, Sales Agents **Cable Address: Dougalt, A.B.C. 5th edition**

NO UP-TO-DATE MACHINE TOOL SHOP
IS COMPLETE WITHOUT OUR FULL

Universal Radial Drilling Machine

Length of arm, 4 ft. 2 in. Drills holes up to 3¼ inch.

Excellent finish. High class Workmanship
Made from the best material
All gear wheels are machine cut



Our prices are the most attractive ever offered.
Do not hesitate to call upon us for quotations and specifications.

MUSSENS LIMITED

HEAD OFFICES: MONTREAL

MONTREAL TORONTO COBALT WINNIPEG CALGARY VANCOUVER

The advertiser would like to know where you saw his advertisement—tell him.

CIRCULATES EVERYWHERE IN CANADA

ALPHABETICAL INDEX ON LAST PAGE

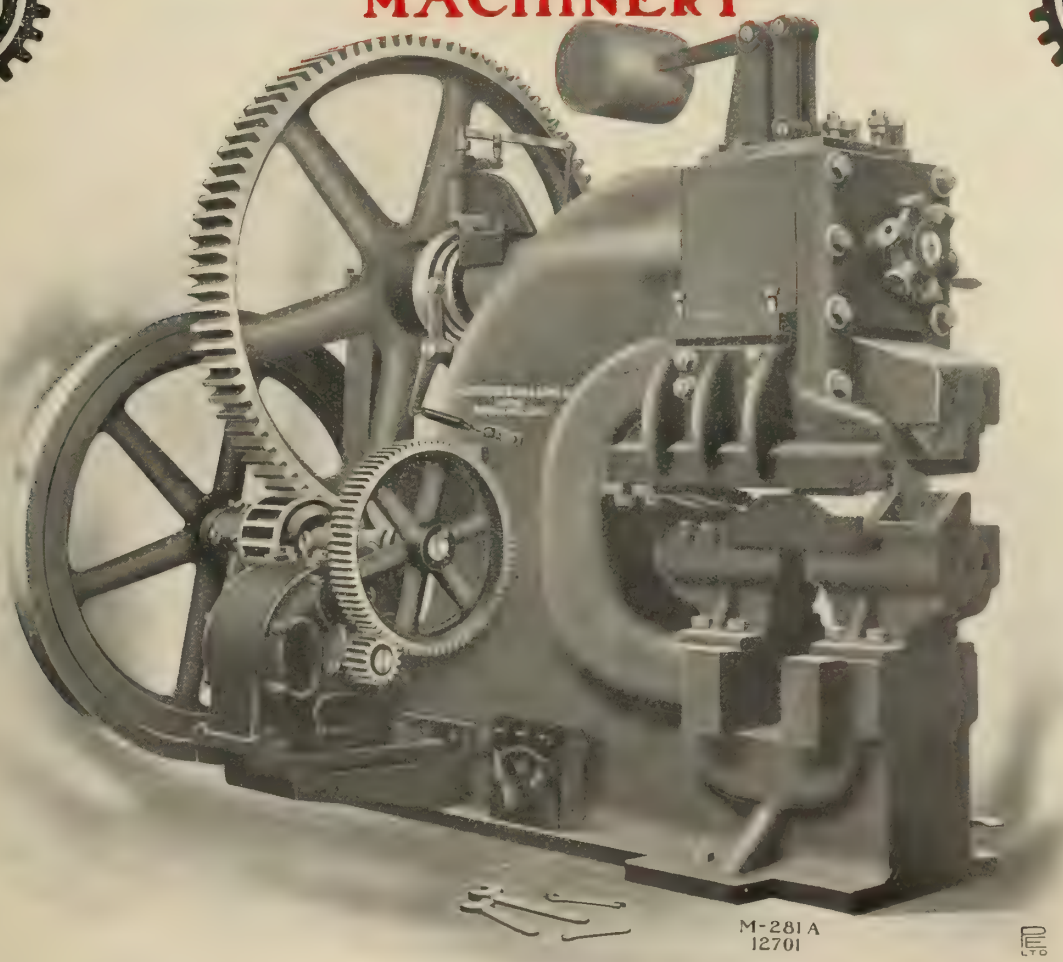
CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

MONTREAL, Eastern Townships Bank Bldg. TORONTO, 143-149 University Ave. WINNIPEG, 511 Union Bank Building. LONDON, ENG., 88 Fleet Street, E C

Vol. VII. Publication Office: Toronto, March, 1911. No. 3

BRIDGE and BOILER SHOP MACHINERY



BERTRAM SINGLE BEAM and CHANNEL PUNCHING and COPING MACHINE—Motor Driven.

WRITE FOR PHOTOGRAPHS AND PARTICULARS.

The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO, CANADA

Agents:—The Canadian Fairbanks Co., Ltd. Offices:—Montreal, Toronto, Winnipeg, Vancouver, Calgary, St. John, Saskatoon.

A Machine for Manufacturing

And it looks it—not a frail or weak part in the entire construction, It is a machine meant for business—to do business on a manufacturing basis—an economy basis.

It is a business builder, not only on account of its wonderful latitude—its flexibility and adaptability—but on account of its stability—its staying qualities—its continued accuracy—its wonderful control and ease of manipulation—its duplicate manufacturing that does away with all bench work. Turns out every piece of work fully finished—and interchangeable—ready to be assembled—castings, forgings or rod work.

And the tool outfit—once complete—always complete, to meet any manufacturing demands. That is

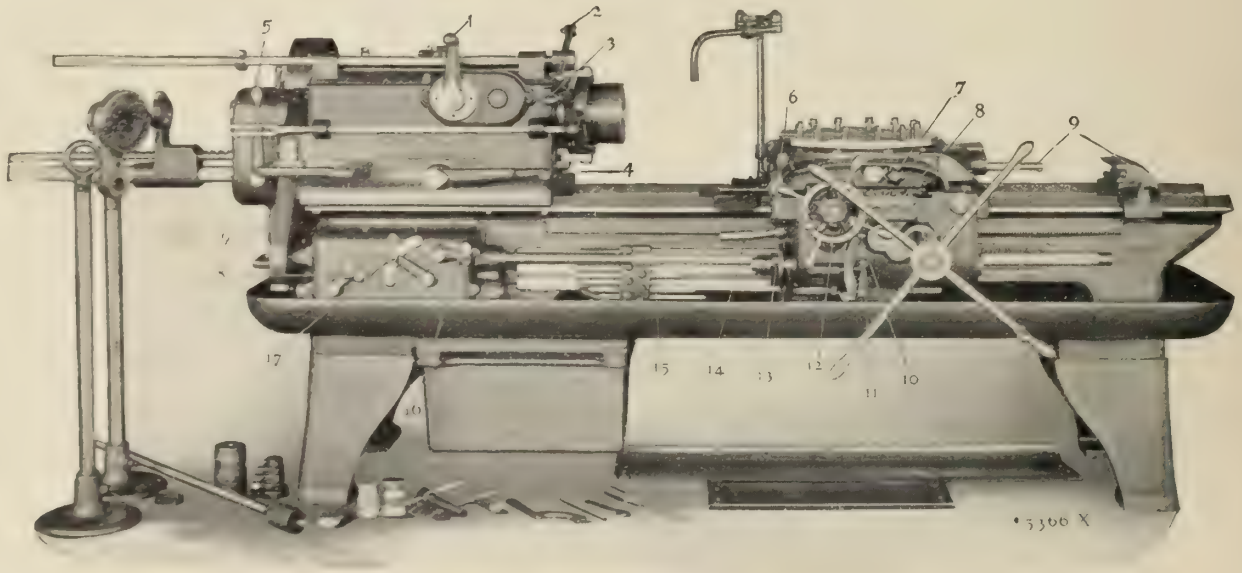
The Turntable Lathe

With Cross-Sliding Turntable

It has the design, weight, power and construction behind it. Bar capacity 2½ x 26 in. Swing 20 in.

Write for Catalog, "The Turntable Lathe."

P. & W. 2½ x 26-in. TURNTABLE LATHE
Arranged for Bar Work



1 Speed Changing Lever
2 Rod Stop
3 Chuck Lever
4 Speed Back Gear Lever
5 Stock Feed Lever
6 Turntable Binder
7 Transverse Stop Change Knob
8 Transverse Stops
9 Index Abutments
10 Feed Disengaging Lever
11 Feed Engaging Lever
12 Transverse Feed Handwheel
13 Longitudinal Feed Stop Lever
14 Carriage Binder
15 Longitudinal Stops
16 Feed Reverse Lever
17 Feed Changing Lever
18 Feed Back Gear Lever
18 Oil Pump

Pratt & Whitney Co.

HARTFORD, CONN., U. S. A.

Sales Agents---The Canadian Fairbanks Co., Limited

Montreal St. John Toronto Winnipeg Calgary Vancouver

Equally Handy for Nut or Pipe Work!



Here's a tool that should find a place in every mechanic's kit, the

"B and C"

Combination Wrench

It does the work of two ordinary wrenches, and is made of very best materials, and well finished.

Head, bar and shank are a one-piece steel forging.

Send for complete Catalogue of Wrenches.

Bemis & Call Hardware and Tool Co.

SPRINGFIELD, MASS., U.S.A.

S & S AUTOMATIC Gear Hobbing Machines



One of our customers writes us:

"We were using six automatic gear cutters in our works, but since putting in your machine we have been able to turn out as much work on your machine as on any three of the others and with greater accuracy."

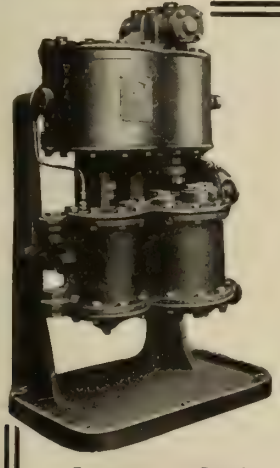
This great output and accuracy are not only due to the Hobbing System, but also to the rigid construction and right distribution of weight in our machine The patented features of our machine place it in a class by itself.

Write for Particulars

SCHUCHARDT & SCHUTTE

4 Cedar Street, NEW YORK

Montreal Office, 307 Coristine Building



Compressor on Stand

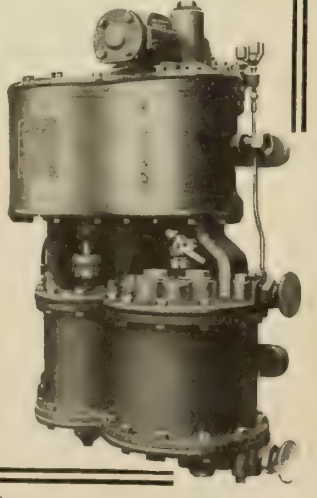
Westinghouse

$10\frac{1}{2}$" Cross-Compound Air Compressor

For Industrial Work

The Westinghouse 10½" Cross-Compound Compressor at a normal speed of 13 strokes per minute, operated on a steam pressure of 100 lbs., working against 80 lbs. air pressure, has a displacement capacity of 150 cubic feet of free air per minute.

It is a compact, self-contained unit, compounding both air and steam, thereby securing a very high efficiency with a low steam consumption per 100 cubic feet of air compressed.

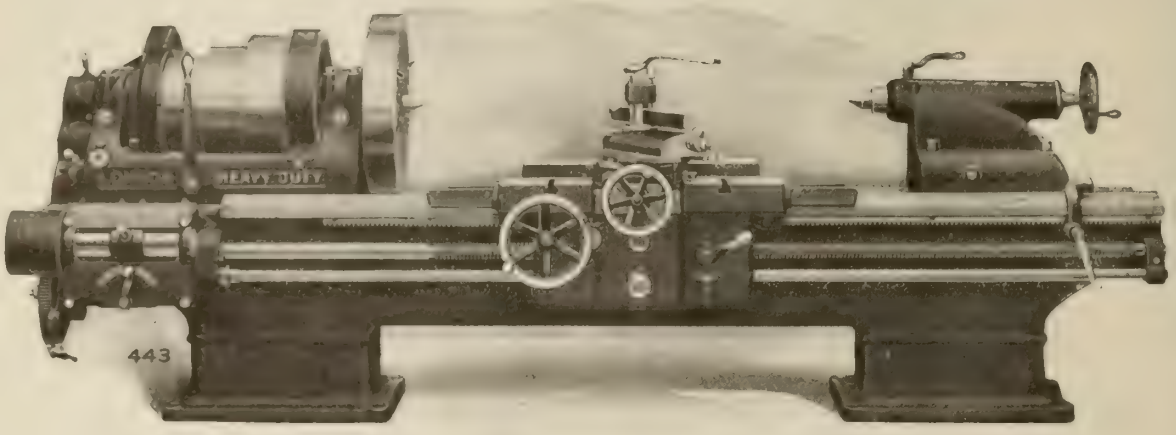


Canadian Westinghouse Co., Limited

General Office and Works, HAMILTON, ONT.

Traders Bank Building	For Particulars Address Nearest Office:		52 Victoria Square
TORONTO	HAMILTON		MONTREAL
439 Pender Street	158 Portage Avenue East	311 8th Avenue West	Telephone Bldg.
VANCOUVER	WINNIPEG	CALGARY	HALIFAX

Important Announcement



By special arrangement with the R. K. Le Blond Machine Tool Co., of Cincinnati, we are now enabled to offer for the first time in Canadian Machine Tool History, Lathes made in Canada from designs based on the wealth of experience afforded by the United States market, the greatest machine tool market in the world.

By this arrangement we have obtained not alone the designs, but also the jigs and other fixtures which make for accuracy, interchangeability, and produce unequalled workmanship at a minimum of cost.

The above Lathes represent the very last word in Lathe Construction. Powerful, yet accurate and easily handled—designed for getting the greatest amount of work with a minimum of expenditure of energy on the part of the operator.

Details of construction will appear from time to time in our advertisements.

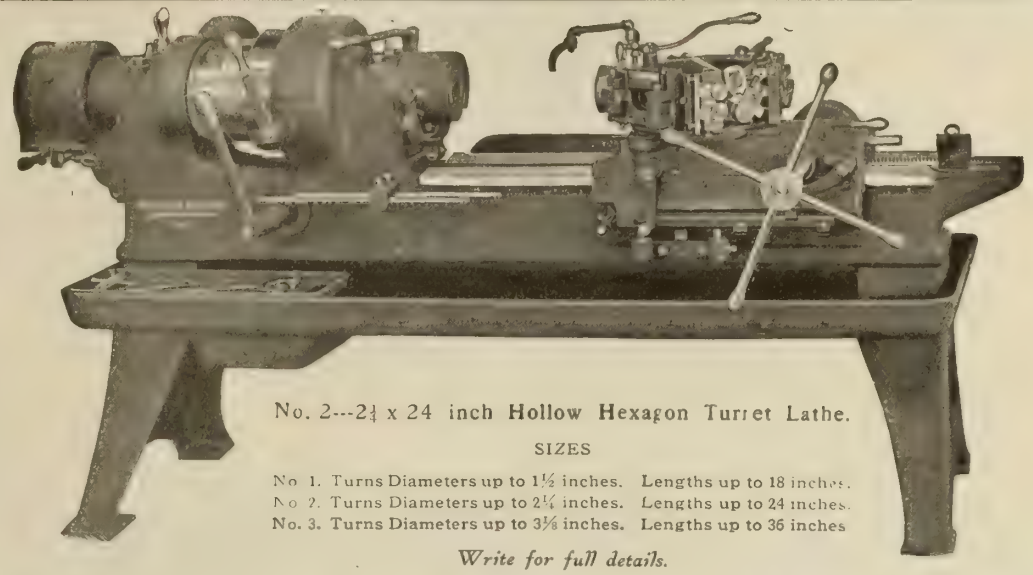
London Machine Tool Co., Limited

HAMILTON, CANADA

Eastern Agents Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que

HOLLOW HEXAGON TURRET LATHES

They are constructed to meet the approval of the most exacting purchaser. The design and detail have been worked out on mechanical principles and as a result a most Simple, Powerful, Economical and Efficient machine has been produced to meet the requirements of general machine shop practice on Bar Stock as well as Forgings.



No. 2---2¼ x 24 inch Hollow Hexagon Turret Lathe.

SIZES

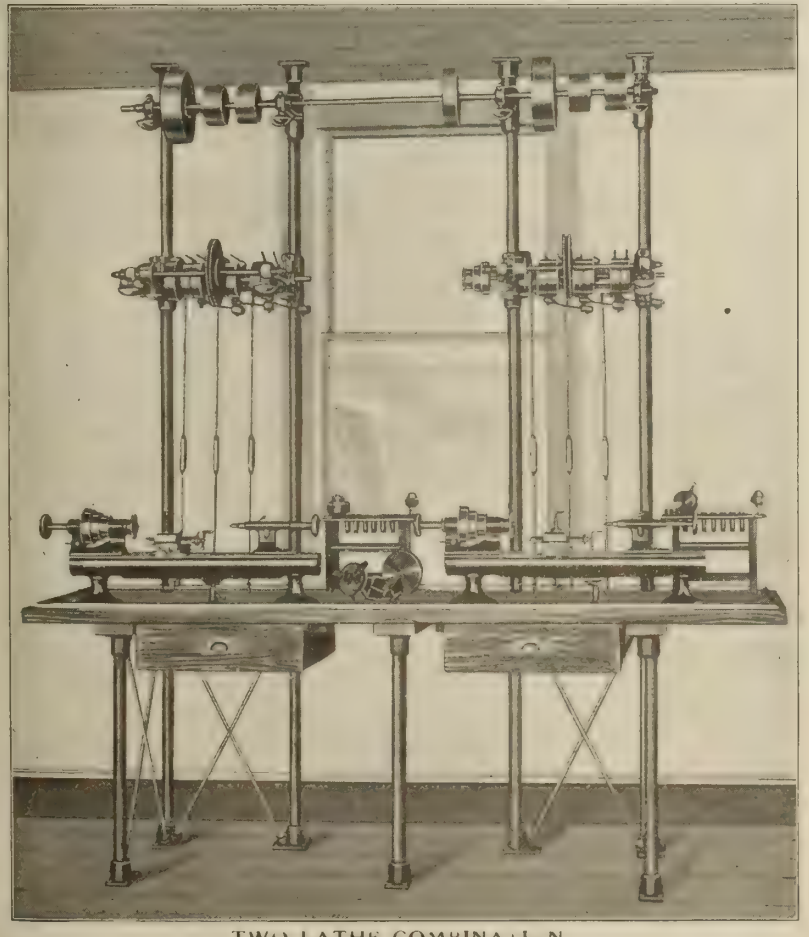
No 1. Turns Diameters up to 1⅛ inches. Lengths up to 18 inches.
No 2. Turns Diameters up to 2¼ inches. Lengths up to 24 inches.
No. 3. Turns Diameters up to 3⅛ inches. Lengths up to 36 inches

Write for full details.

THE WARNER & SWASEY COMPANY

Main Office and Factory CLEVELAND, OHIO

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams & Wilson, Montreal



TWO LATHE COMBINATION

Would You Put a MAN at a BOY'S JOB?

Why tie up a 14" or 16" Lathe on a job which can be handled to better advantage on a **HARDINGE BENCH LATHE of 7" SWING.**

Consider the convenience of installing the **HARDINGE STANDARD BENCH** equipment.

These Benches are make in six, eight and twelve foot lengths, to carry one, two or three Lathe combinations.

MANUFACTURED BY

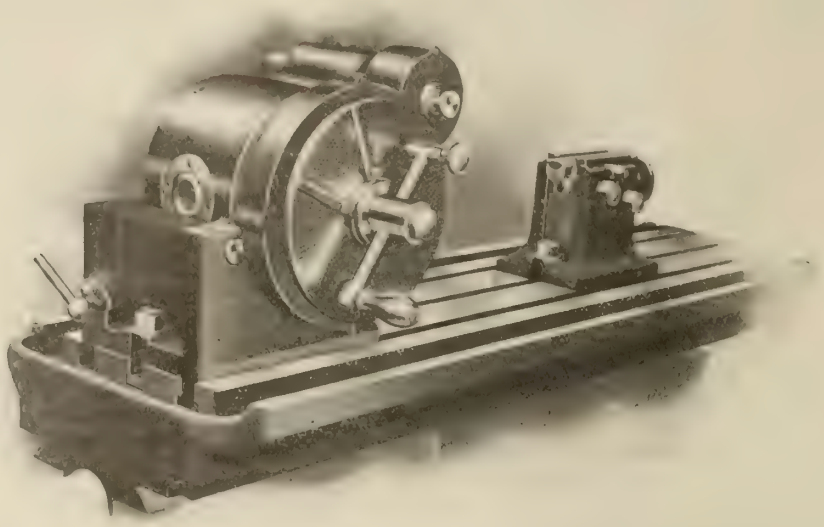
Hardinge Brothers, Inc.

3133-3141 Lincoln Avenue

CHICAGO - - ILLINOIS

Write for Illustrated Catalogue No. 190.

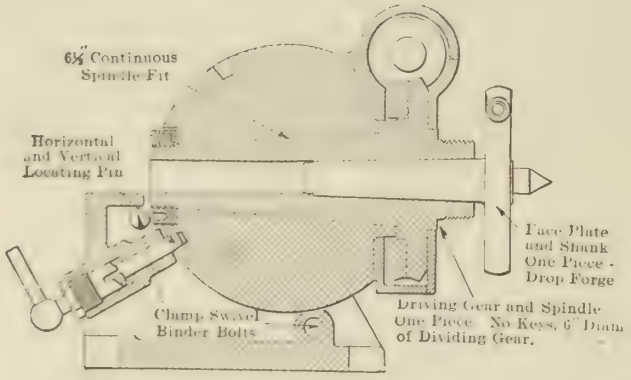
Don't fail to mention "Canadian Machinery" in writing to advertisers.



Garvin Double-Geared Dividing Heads

For Accuracy and Fine Work

Appreciated most by those who have experimented with the other kind.



Heads are put through the most rigid inspection before leaving shop and have been highly commended by users for their accuracy and rigidity under the most exacting cuts. The heads

Divide all numbers to . . .	150
Numbers divisible by 2 and 5 to	300
Numbers divisible by 3 to . .	360

Dividing mechanism undisturbed. Accuracy maintained when changing for quick indexism. As may be seen by sectional cut, the horizontal and vertical positions can be instantly located. Note the spindle with a ground taper bearing its entire length, being solid with the dividing gear, which is of large diameter and is located as near the work as possible. Wedge take-up for wear in dividing gear. Many other valuable features. Manufactured in three sizes, 10, 12, and 14 inches, and are part of the equipment furnished with our Universal Milling Machines.

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

MANUFACTURERS OF

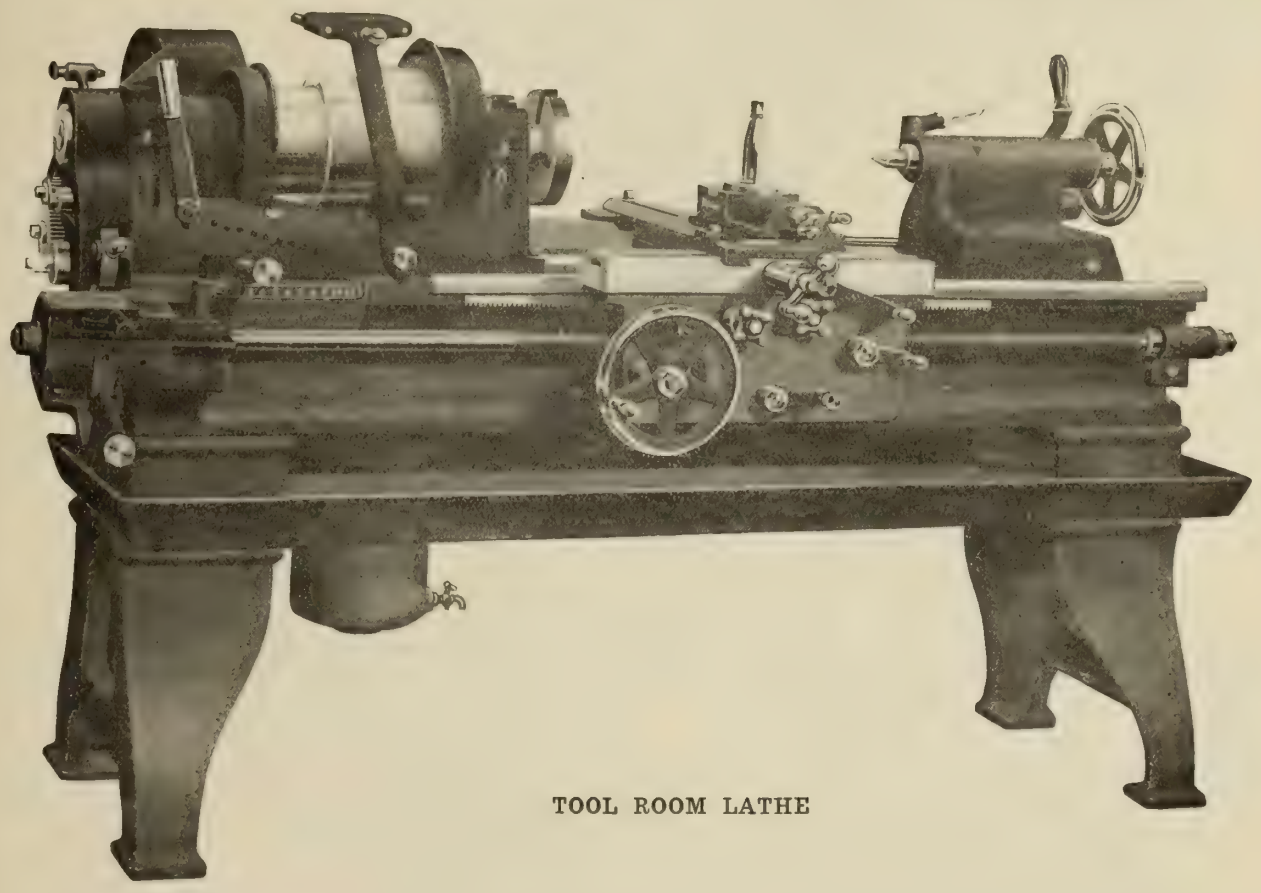
Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.

The advertiser would like to know where you saw his advertisement—tell him.

LATHES

Shapers, Planers, Slotters, Punches, Shears

Latest Designs, Finest Workmanship



TOOL ROOM LATHE

Note the appearance of this machine. Hundreds of them in use, and every one giving satisfaction. One grade only and that the best.

Write for Catalogue.

Canada Machinery Corporation, Limited

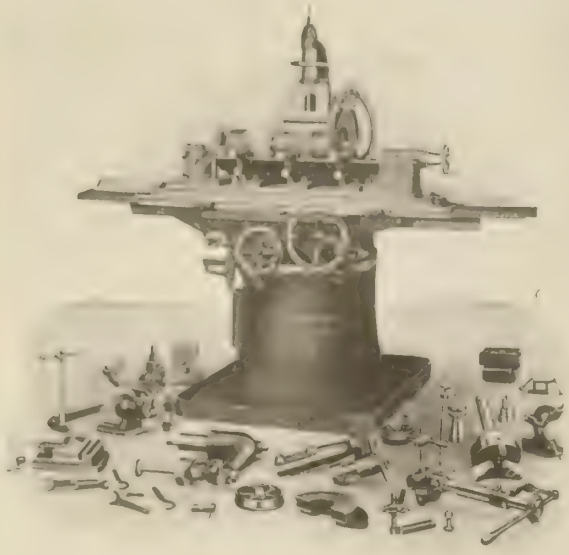
GALT, ONTARIO

Agents:

A. R. Williams, of St. John, Limited A. R. Williams, Limited, Toronto. A. R. Williams, of Winnipeg, Limited.
Williams & Wilson, Limited, Montreal. A. R. Williams, of Vancouver, Limited

Don't fail to mention "Canadian Machinery" in writing to advertisers.

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

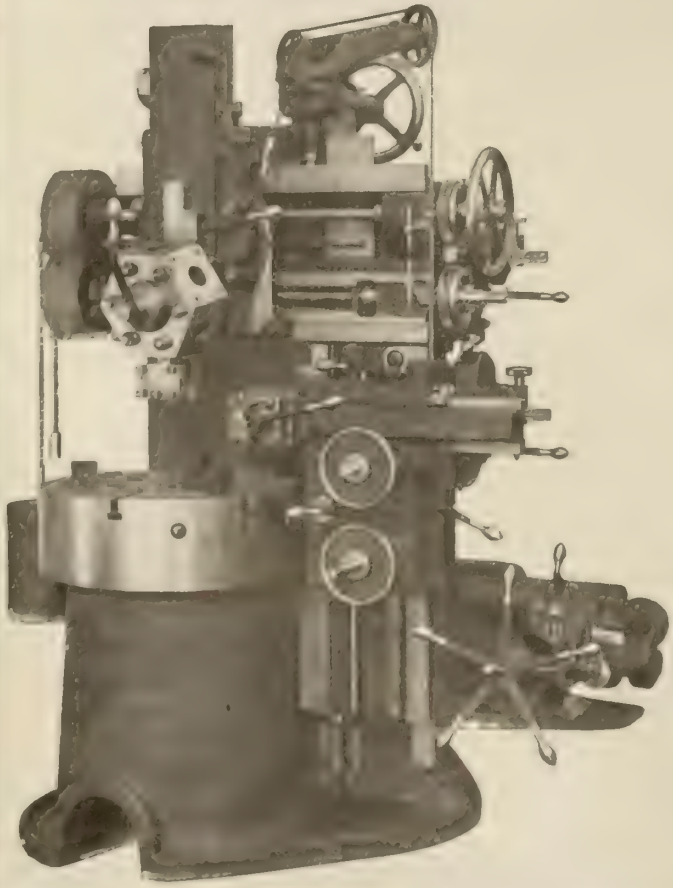
Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

— FOREIGN REPRESENTATIVES —
CHAS. CHURCHILL & CO., Limited, London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow.



You Pay for the Bullard Vertical Turret Lathe Whether You Buy It or Not

And the longer you wait, the more you pay.

IF YOU ARE NOT USING THIS MACHINE YOU PAY FOR IT, NEVERTHELESS, WITH THE MONEY LOST BY YOUR PRESENT METHODS OF PRODUCTION OF ALL FACE PLATE WORK WITHIN THE RANGE OF THE VERTICAL TURRET LATHE.

This loss is caused principally by wasted time.

The fundamental principle of the Vertical Turret Lathe is the "**elimination of wasted time.**"

Time between cuts is reduced by centralized control of the operation of the whole machine, as well as by rapid power traverse of all parts.

With both a Turret and a Side head, machining of several surfaces at once is possible — ***Multi-Cutting.*** And all the tools needed for a series of operations are held in instant readiness.

In all, every possible moment of the machine's and the operator's time is utilized and made efficient.

Ask for Treatise on Face Plate Work C-15.

The Bullard Machine Tool Co.

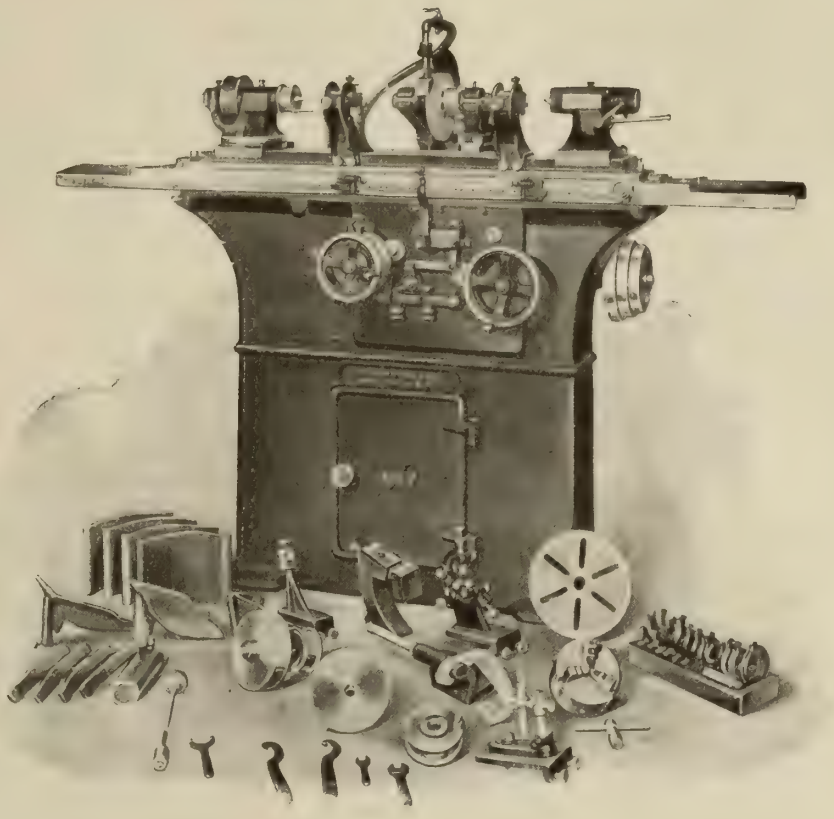
Bridgeport, Conn., U.S.A.

Every Up-to-date Machine Shop should have a

"MODERN" Universal Grinder

Its many points of superiority over ordinary universal grinders are fully described in our illustrated catalogue, a copy of which will be mailed to you

FREE ON REQUEST



We would also be glad to place our experience at your disposal.

This machine is more rigid and durable, and is better made than most grinders' and it produces more work and better work than any similar machine made.

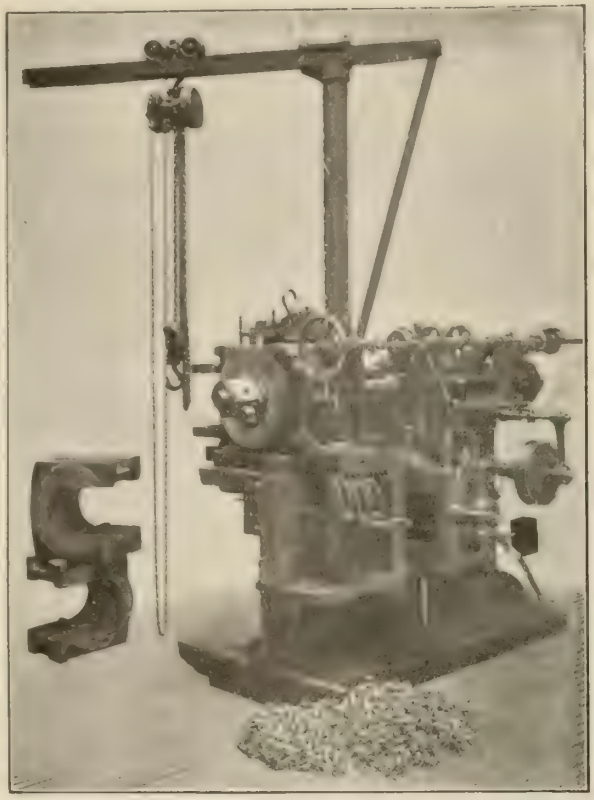
Among the many improvements incorporated in the Modern Universal Grinder is our new patented table hand wheel stop, which STOPS HAND WHEEL WHILE TABLE IS IN MOTION, thereby eliminating the shock from the quick reverse of the hand wheel.

Made in two sizes—sold at interesting prices. It will be worth your while to write us before buying.

MODERN TOOL CO.

Erie, Pa., U.S.A.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

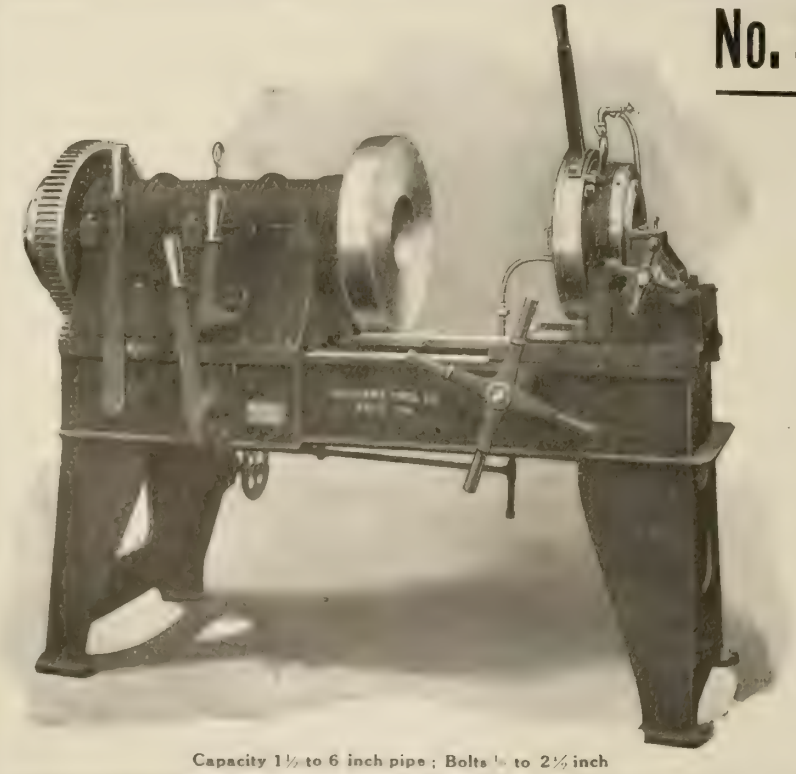
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1⅛ to 6 inch pipe; Bolts ⅛ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼″ to 2″; ½″ to 3″; 1″ to 4″; 1½″ to 6″; 2″ to 8″ and 3½″ to 12″.

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

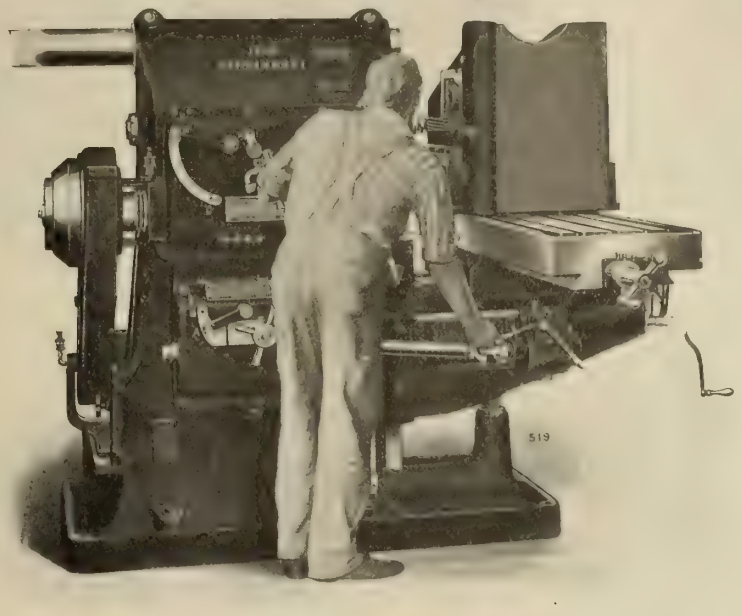
Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.

Cincinnati Handiness



WHEN you have a job of end or face milling to do on a Horizontal Miller, don't you find it hard to operate the feed lever and at the same time keep your eye on the cutter? That's because the machines you are using can be operated from only one place. Our new High Power Machines have an additional feed lever at the side of the knee.

The operator can stand close up to his work, with the cutter in full view, and control the machine from this position.

With this one lever he can operate and reverse table, cross or vertical feeds.

The main starting lever is immediately in front of him and the speed and feed changers are at his elbow, so that the entire machine is under complete control from here.

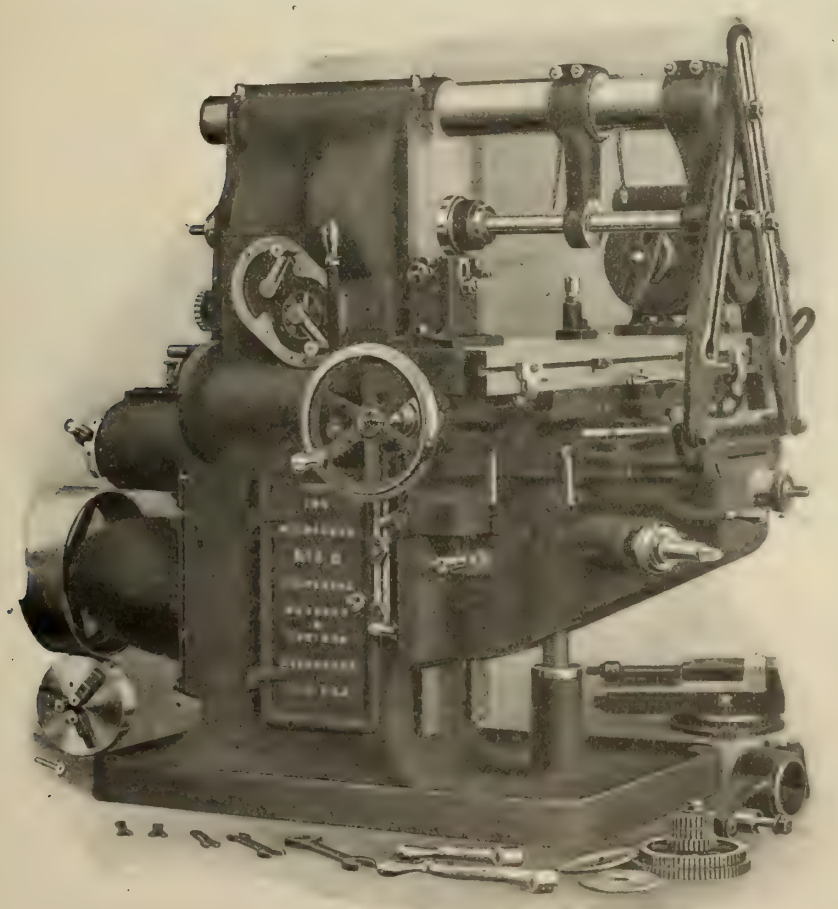
ASK FOR THE CATALOG.

The Cincinnati Milling Machine Company

Milling Specialists

CINCINNATI, OHIO, U.S.A.

Canadian Agent—H. W. PETRIE, Ltd., Toronto, Montreal and Vancouver.



THE MILWAUKEE

No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

Let us send you more particulars.

Kearney & Trecker Co.

Manufacturers - Milwaukee, Wis.

Agents:

The A. R. Williams Mach'y Co., Toronto

Williams & Wilson - Montreal

Machinery Always Busy

These three words express one of the essential requirements of a profitable machine shop business—machinery that is always earning its keep.

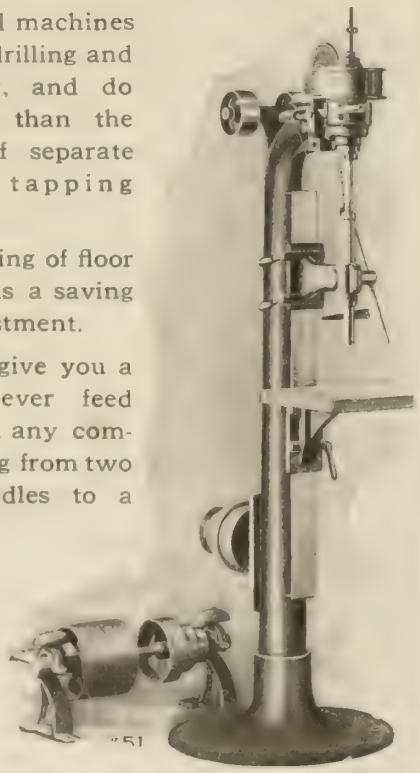
There is no need for you to tie up capital in separate drilling and tapping machines when you do not expect to use each machine constantly. It will pay you better to install a

"Barr" Combined
Drilling & Tapping Machine

Barr combined machines will do better drilling and better tapping, and do them quicker, than the general run of separate drilling and tapping machines.

It means a saving of floor space as well as a saving of capital investment.

We can also give you a power feed, lever feed and tappers in any combination having from two to seven spindles to a machine.



AGENTS WANTED For Other Territory.

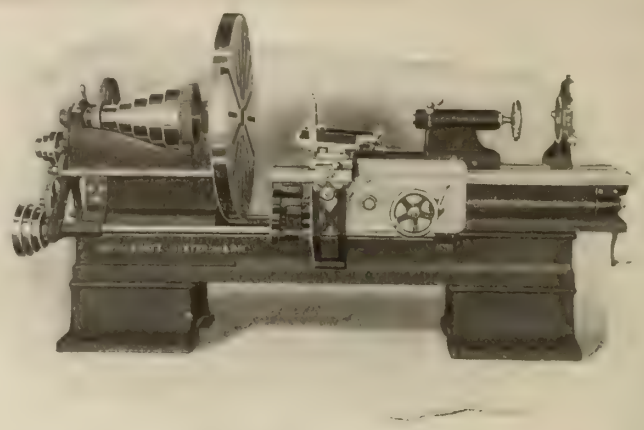
Write for Our Catalog.

H. G. BARR
WORCESTER, MASS., U.S.A.

Agents for Eastern Canada:

Williams & Wilson, Montreal

Where Agents do not handle our machines, we will accept orders direct.



FOR TURNING OUT WORK OF LARGE DIAMETER

An Extension Gap Lathe pays big returns.

Our lathes of this type are always reliable and accurate to a nicety.

Simply sliding the top bed varies the gap to suit all requirements.

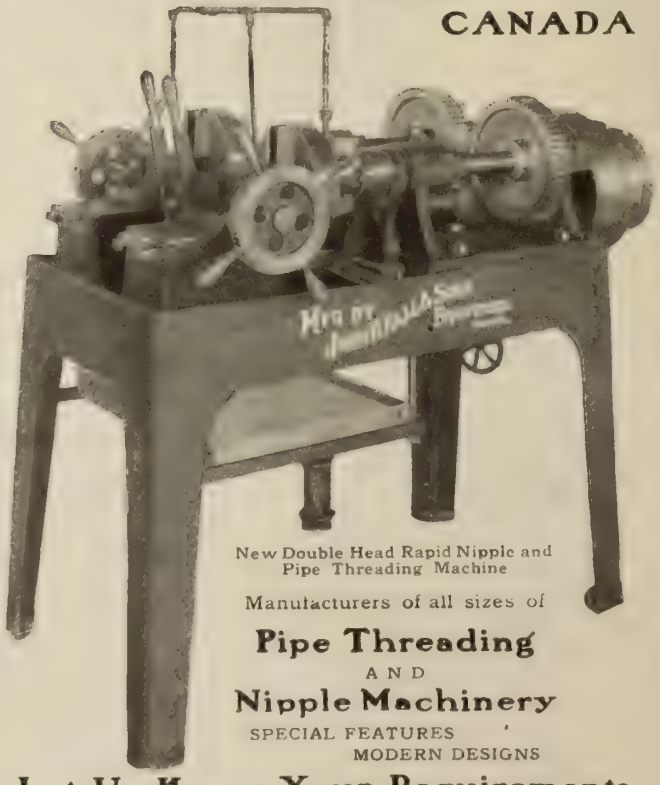
Cut shows our 20-42 inch type.

WRITE FOR CATALOG

FAY & SCOTT, DEXTER, MAINE, U.S.A.

CANADIAN AGENTS— Williams & Wilson, Montreal, Que.
A. R. Williams Machinery Co., Toronto
A. R. Williams Machinery Co., Winnipeg
General Supply Co., of Ottawa, Canada

John H. Hall & Sons
BRANTFORD
CANADA



New Double Head Rapid Nipple and Pipe Threading Machine

Manufacturers of all sizes of

Pipe Threading
AND
Nipple Machinery

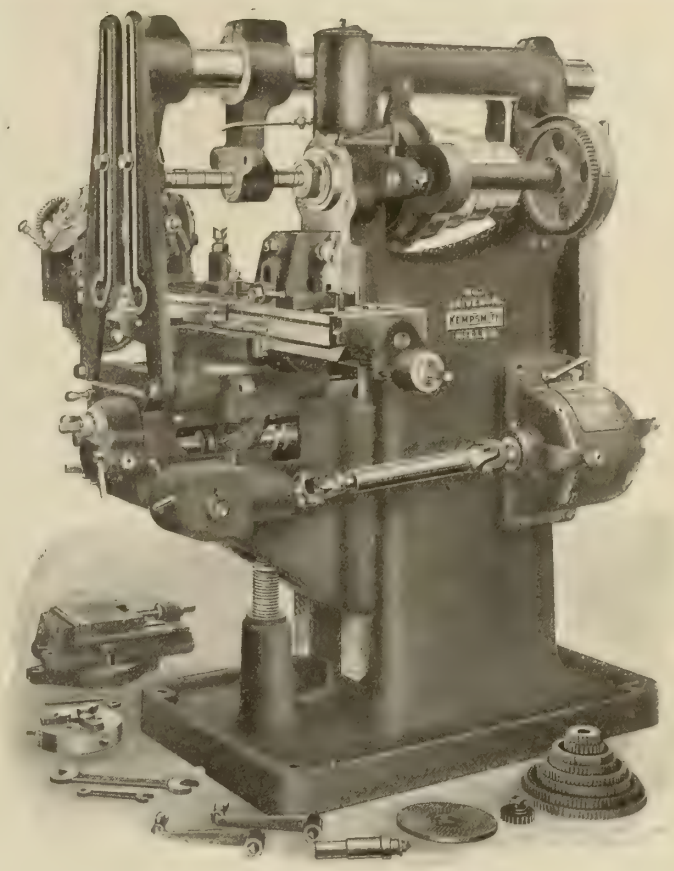
SPECIAL FEATURES
MODERN DESIGNS

Let Us Know Your Requirements.

KEMPSMITH MILLERS

are now being made in our model new plant, where every detail has been carefully planned by experts for its function in the manufacture of these machines.

The facilities for handling materials, both rough, in process of construction and finished: the manufacturing equipment; the manufacturing system; the convenience for the workmen; and so on—all combine for **perfection of construction** of these machines



THE KEMPSMITH MFG. CO.
MILWAUKEE, WISCONSIN

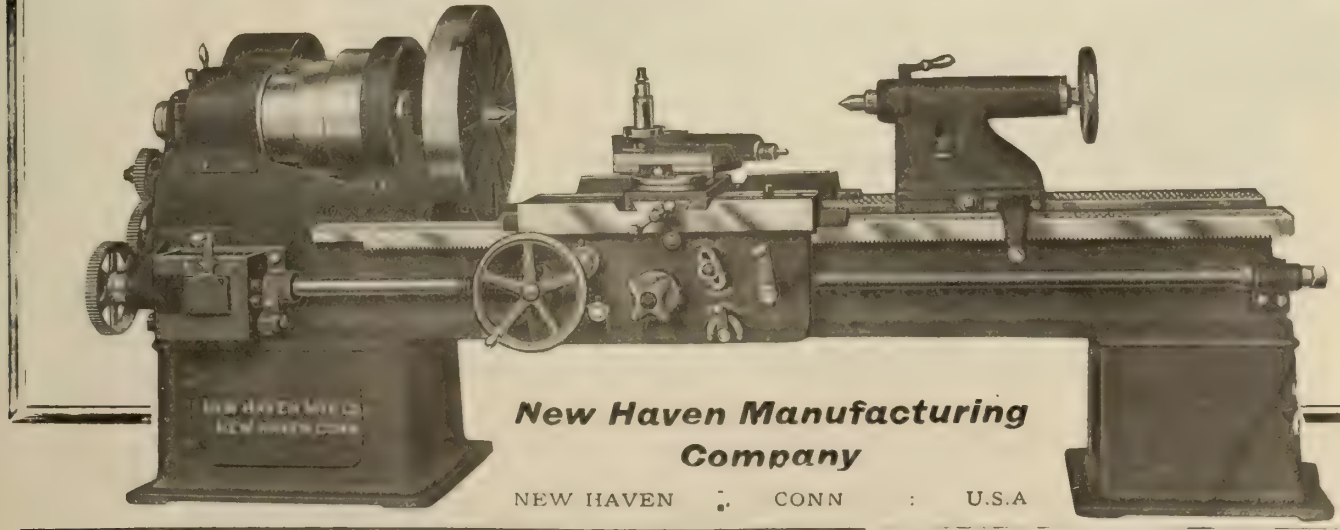
Canadian Agents:
RUDEL-YEATES MACHINERY CO., MONTREAL

NEW HAVEN LATHES

One of the leaders among our celebrated line of lathes is that illustrated below—our

24 inch Swing Standard Lathe

Like all NEW HAVEN TOOLS, it is conspicuous for its accuracy, reliability and durability, and each machine is thoroughly tested before it leaves our shops. Guaranteed unreservedly. Write for detailed specifications and illustrated catalogue.



New Haven Manufacturing Company

NEW HAVEN : CONN : U.S.A

OUR
No. 264 SELF-FEED RIP SAW

Embodies in its construction all features that are necessary for the satisfactory handling of light or heavy material.



No. 264 Self-Feed Rip Saw.

It is equally efficient in ripping SHORT or LONG Stock. Both the in-feeding and out-feeding roll may be adjusted close to the saw, permitting short stock to be fed without trouble.

The Feed Rolls may be instantly raised, converting it into a hand-feed machine when desired.

The table raises and lowers to accommodate different thicknesses of stock.

Capacity—Rips 4 in. thick with a 16 in. saw, and 8 in. with a 24in. blade. Takes 19in. between saw and fence.

WRITE FOR LARGE ILLUSTRATED CIRCULAR

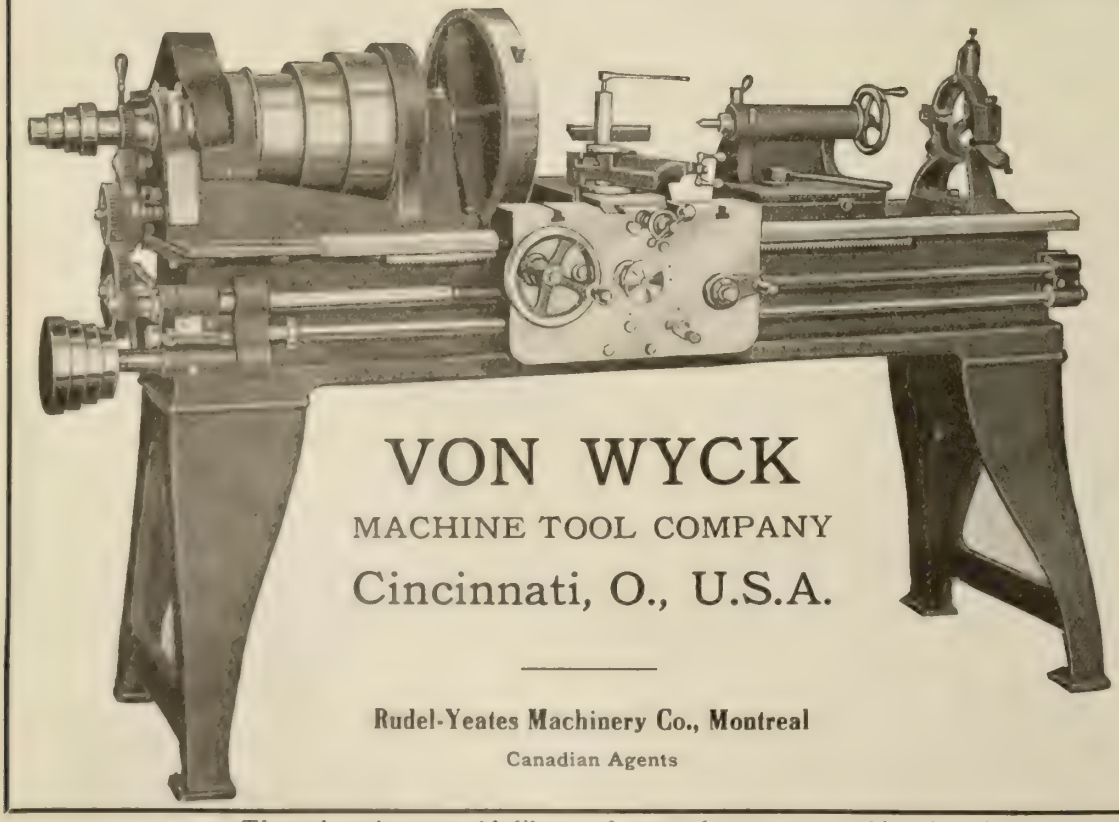
J. A. Fay & Egan Co.

362-382 W. Front Street

CINCINNATI OHIO

A High-Grade Small Engine Lathe at Moderate Cost!

You can use one in YOUR shop.



FREE from fussy attachments and mere talking points, the Von Wyck 15-inch engine lathe offers such a combination of convenience and economy that operators maintain, "It is unequalled by any lathe of its swing."

WHY buy a large size and pay a big price to get great strength and efficiency? Von Wyck design and construction are thoroughly high grade in every important detail and satisfactorily cover an unusual range of work.

VON WYCK

MACHINE TOOL COMPANY

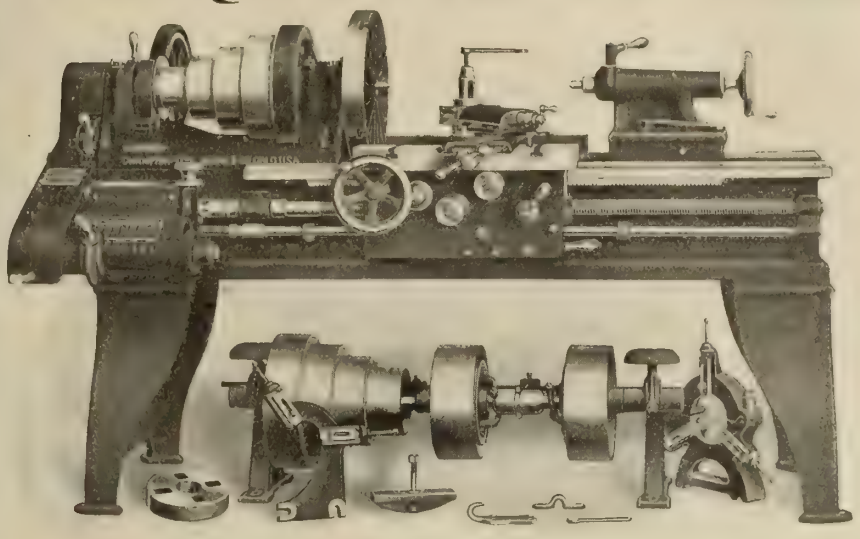
Cincinnati, O., U.S.A.

Rudel-Yeates Machinery Co., Montreal

Canadian Agents

The advertiser would like to know where you saw his advertisement—tell him.

The Quick Feed and Thread Changes on CHAMPION LATHES



16-in. Quick Change Lathe.

Are so easily made that they are in striking contrast to the many so-called quick-change devices which wear the patience of the operator in hauling, pulling and jerking levers to shift gears, that there is little wonder lathe hands don't take advantage of feed changes, but instead run on practically one feed

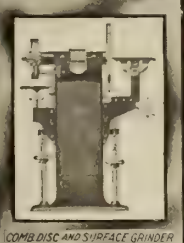
These changes on the **Champion** are so simple and comprehensive that the operator on learning how easily and quickly they can be made, takes advantage of the correct feeds and speeds without fear of complications.

Write for Our Catalogue of 10-12-14-16 and 18-inch Lathes; Quick Change or New Standard, with or without Taper Attachment, Draw-in Attachment, Turrets, etc.

CHAMPION TOOL WORKS COMPANY

Station B CINCINNATI, OHIO, U.S.A.

GRINDER LINE



COMB. DISC AND SURFACE GRINDER



No. 2 GRINDER



COMB. WET AND DRY GRINDER

The Valley City Combination Disc and Surface Grinder

is an especially advantageous machine for the pattern shop and for all kinds of tool and surface grinding. The very substantial construction, body of machine one solid casting, eliminates vibration and contributes to accurate product. All conveniences—rapid adjusting screws, tilting table, micrometer adjustment for upper table, rest for tool grinding—a complete and efficient machine.

Full line includes Wet and Dry Grinders, Combination Machines, Buffing and Polishing Machines.

Send for Catalogue.

Valley City Machine Works

20 Compau Street, Grand Rapids, Mich.





HOLD YOUR ORDER



for **POLISHING, BUFFING or GRINDING Machinery**

until you have examined our new catalog.

The line is perfect in design, well finished, and smooth running, and is guaranteed to give highly-satisfactory service in every respect.

We invite the fullest enquiry. Write also for details of our Speed Lathes and Wet Tool Grinder.

J. G. Blount Company

EVERETT, MASS., U.S.A.

KELLY
REAMERS.

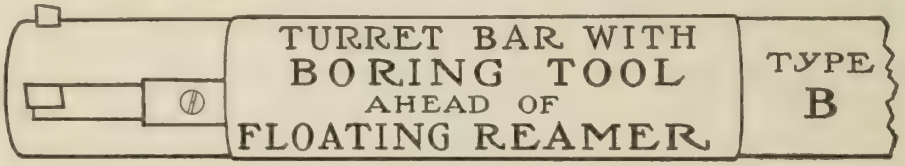
HIGH SPEED BLADES

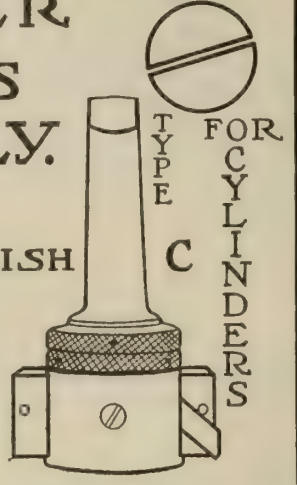
THE BUSINESS END IS A SMALL PART of ANY REAMER

THE KELLY HAS THAT PART ONLY.

CATALOG?

KELLY RECORDS, — 1200 HOURS WITHOUT ATTENTION, GIVING SIZE AND FINISH





THE KELLY REAMER CO. CLEVELAND U.S.A.

Ask if the long blade does anything but damage—after the business end gets through—by giving an over-size hole?

Machine ream your parts to a ten-thousandth with a **Kelly Floating Reamer,** and your long bladed reamer will "go" along with the old "chipping chisel."

Let us tackle your **very toughest reaming job**—it will be "easy" for us and will mean **dollars for you.**

State **exact** size of hole, size of boring bar desired, and do it on your trial order **to-day.** Tell us **all about** your job. We **must know** all the **details.**

Type C for Cylinders.
3" to 12" carried in stock.
A 5" shell reamer costs you **net** $17.33; has no adjustment, is soon **under size** and—**junk.**

Type B for turret, drill or lathe.
1" to 5¼" carried in stock.
A 4¾" to 5" Kelly costs net $5.00, has adjustable, **replaceable,** high speed blades—**they last.**

QUICK ACTION

After getting a No. 2 $15.00 Kelly Turret Bar, which holds 1¾" to 5¼" reamers, you can **wire us** for any size of reamer and we will land it on your desk **the following day via Mail.**

Ask about Cylinder reamers.—Catalog C. We do it that way—KELLY.

THE KELLY REAMER CO.
CLEVELAND, U.S.A.

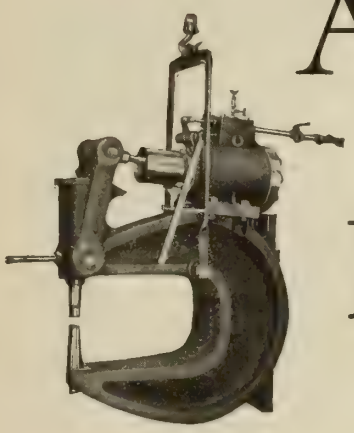
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You are SURE of the

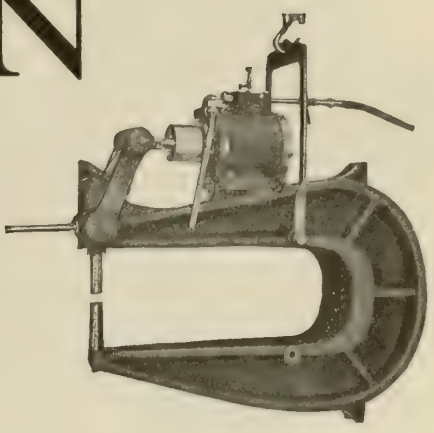
Fastest and Tightest Riveting

at the LOWEST COST, with

ALLEN



PORTABLE
PNEUMATIC



RIVETERS

Merit is built into every part of these machines. Their design and construction combine all the latest improvements in power riveters and insure the maximum results at the minimum cost.

We have recently placed Riveters with the Manitoba Bridge and Iron Works, Winnipeg, Manitoba; and Wm. P. McNeil & Co., New Glasgow, Nova Scotia.

Send for our Catalogue, "Riveting Machines." It will interest you.

"Whatever the Riveting—There's an ALLEN for the Job."

JOHN F. ALLEN COMPANY

Established 1872

370-372 Gerard Avenue, New York

AGENTS—CANADIAN RAND DRILL CO., Toronto, Halifax, Montreal



High-Speed Steam-Hydraulic Forging Presses

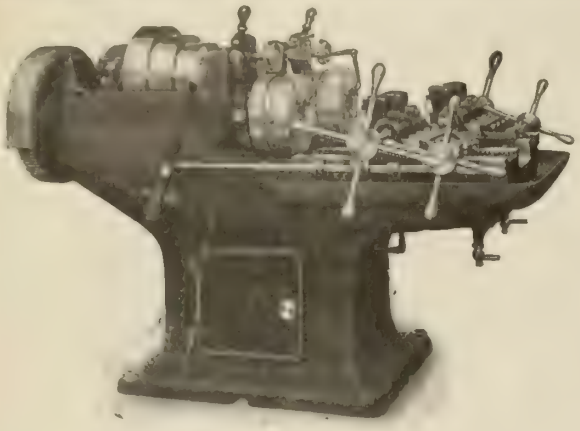
Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.
2305 Farmers Bank Building, PITTSBURG, PA
EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO.
Manufactured under Davy Bros., Ltd., Patents.



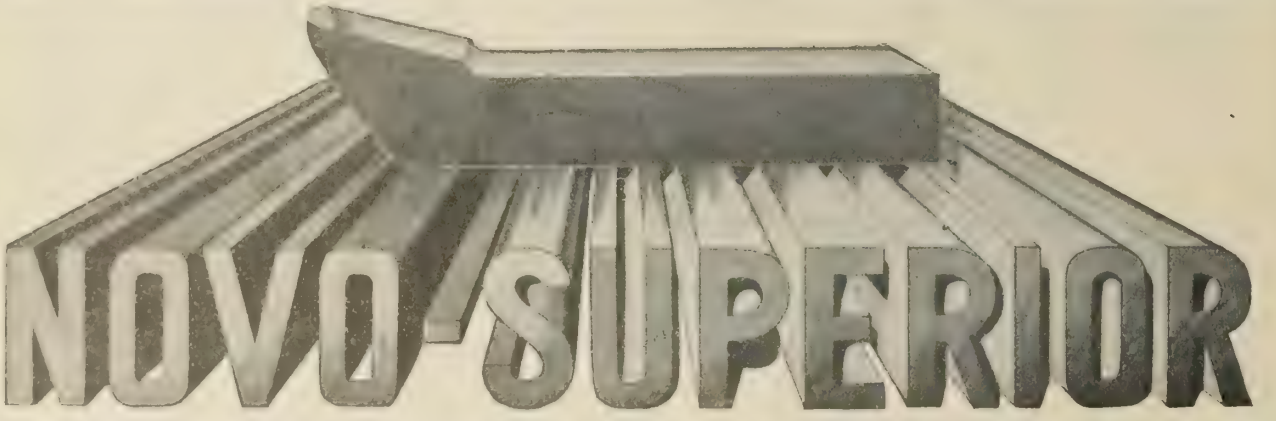
Protected by Patents

HEAP'S High Speed BOLT and PIPE THREADING Machines are made in all sizes with Single and Multiple Heads.

Our New Patent Die Head is the most simple and the only mechanical Die Head on the market.
The dies are not operated by springs with their attendant troubles.
Before placing your orders enquire closely into our claims.

Send for Catalogues

Joshua Heap & Co., Limited
Ashton-under-Lyne, England
Canadian Agents: PEACOCK BROS., Montreal



High Speed Steel Has a Solid Foundation In a Name That Means Something

Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND CONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.



Edgar Allen & Co., Limited

Manufacturers of

TRAMWAY POINTS and CROSSINGS

Tramway Passing Places, Junctions, Depot Sidings, Lay Outs

Supplied complete with all Fittings ready for laying on the road.

OVER 20 YEARS' EXPERIENCE

Sole makers of

ALLEN'S IMPERIAL MANGANESE STEEL

Manager for Canada--THOMAS HAMPTON

330 ST. JAMES STREET : : MONTREAL

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

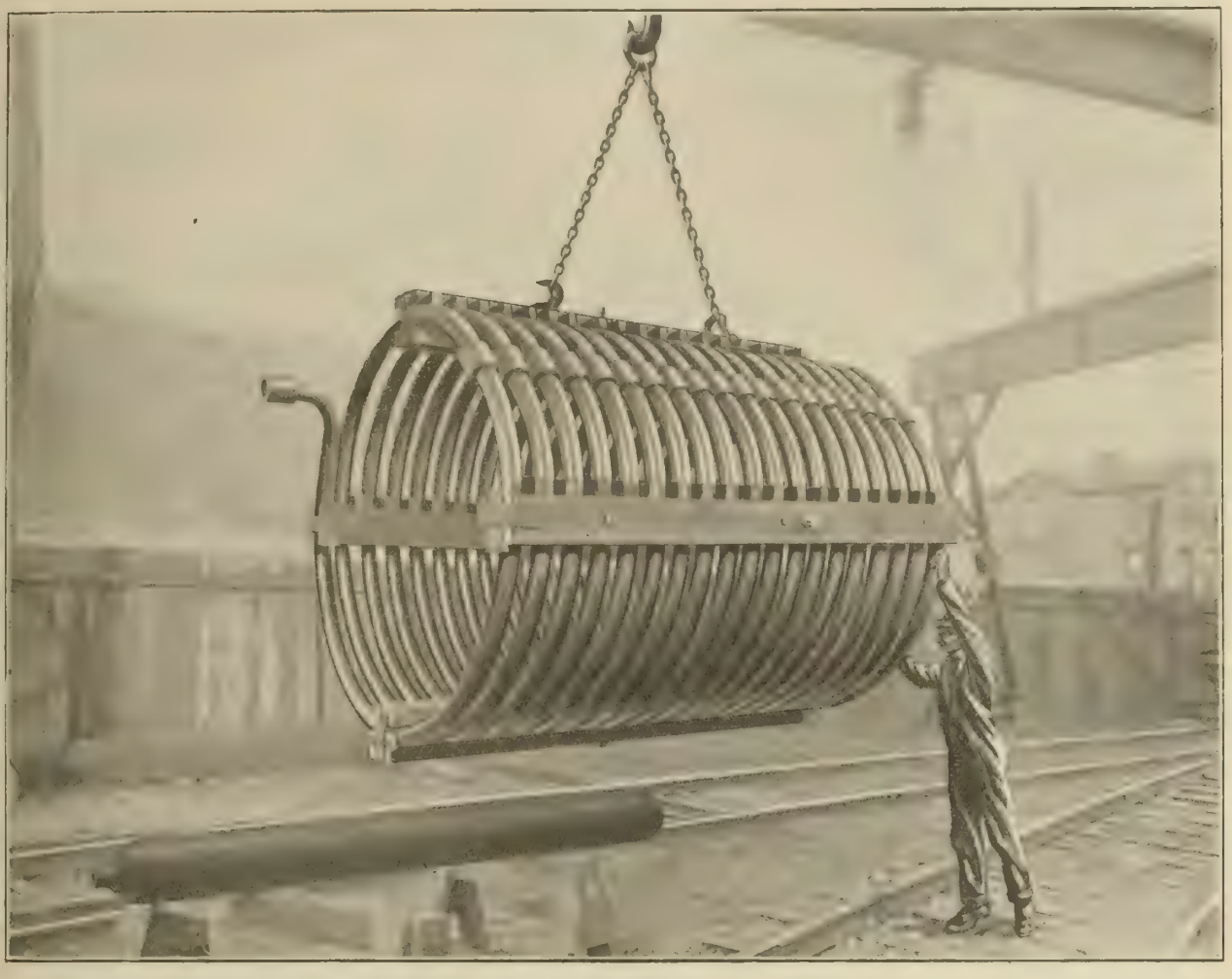
REPRESENTATIVES

L. F. McClernan
1243 Peoples Gas Bldg.
CHICAGO

L. F. McClernan
1417 Ford Bldg.
DETROIT

L. D. Rockwell
U.S. Express Bldg.
NEW YORK

SHELBY SEAMLESS STEEL TUBING



This photograph shows a remarkable coil of Shelby Seamless Steam Tubing turned out recently for La Cie de Gaz de Lachine, Lachine.

The diameter of the coil is nearly seven feet, and the length about twelve feet. It is made up of twenty circular sections of tubing 3⅞ inches in outside diameter, with 9/16 inch walls—a total of 400 feet of tubing,

The seamless steel cylinder shown resting on the trestles is 9 feet long, 9⅝ inches outside diameter, with walls 1⅜ inches thick, and a capacity of 3,800 cubic inches. Test pressure 6 tons per square inch.

We show this coil and cylinder because they give an idea of the out-of-the-ordinary work which we can turn out in Shelby Steel Tubing. Shelby Tubing can be

Bent, Flanged, Expanded, Tapered, Upset, Spun, Case-hardened, Machined infinitely, Applied manifoldly.

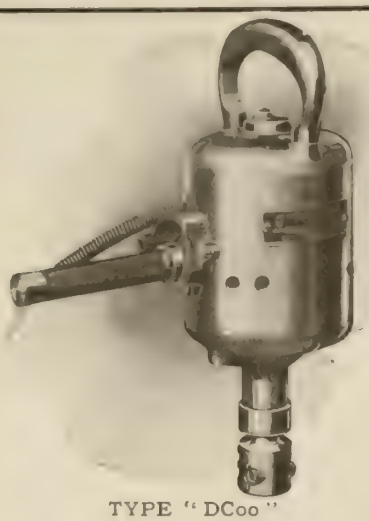
We are prepared to handle all kinds of special work in Seamless Steel Tubing, or to make Seamless Steel Cylinders in any size or capacity. Write us about your requirements. We shall be glad to suggest ways and means of meeting them economically and to the best advantage.

JOHN MILLEN & SON, Limited

MONTREAL TORONTO WINNIPEG VANCOUVER

Address all correspondence to 321 St. James Street, Montreal.

"HARD SERVICE" (Portable)



TYPE "DCoo"

Electrically operated

DRILLS AND REAMERS

Built in 6 sizes. Scope 0 to 2."

Are you operating to the best advantage in drilling large and heavy parts? You could no doubt save money and time on others by taking a machine to your work instead of the work to the machine. "Hard Service" Drills and Reamers are the solution of the problem. Your ultimate Machines if you want maximum production at minimum cost.

Write for descriptive matter, information and prices.

THE VAN DORN & DUTTON COMPANY
CLEVELAND

Canadian Representative: R. E. T. PRINGLE, Eastern Townships Bank Bldg., Montreal, Quebec.

SOME of Our Specialties

PNEUMATIC AND ELECTRIC TOOLS—"New Boyer" Riveters and Chippers. "Little Giant" Pneumatic Drills, Duntley Air Cooled Portable Electric Drills, Grinders, etc., manufactured by the Chicago Pneumatic Tool Company.
AIR COMPRESSORS—"Franklin" Type, all styles and sizes.
ANTI-RAIL CREEPERS—All types, absolutely prevent rails creeping.
BUMPING POSTS—The "Gibraltar" Structural Steel.
RAIL BENDERS—Q. & C. "Samson."
LOCOMOTIVE AND CAR REPLACERS—"Fewings" Cast Steel.
COUPLER KNUCKLES— "Gilman Brown" Emergency.
JOURNAL BOXES—"McCord" Malleable Iron.
PRIEST SNOW FLANGERS—Bring your trains in "On time."
"AJAX" CAR VESTIBULE DIAPHRAGMS—Canvas, with steel reinforcement.
PANTASOTE CURTAIN MATERIALS—Any style, latest design.
FREIGHT CAR DOOR FIXTURES—Security Side and End Door. Dunham Side end End Door.
STEEL BACK BRAKE SHOES—Locomotive, tender, passenger and freight car equipment.
MONKBRIDGE STAYBOLT IRON—Best Yorkshire, stands all tests.
McKIM GASKETS—Copper covered, asbestos and rubber filled.
GRAY'S CHIMNEYLESS LONGTIME BURNERS—None equal, ask us for sample.
FORSYTH BUFFING DEVICE—The high capacity shock absorbing device.
CONCRETE REINFORCEMENT STEEL—Maxwell "Deformed" Bar.
H. R. RATCHET BRAKE LEVER—For all classes of equipment.

If you would like catalogues or prices, write us, and we will forward same promptly and cheerfully on receipt of your request.

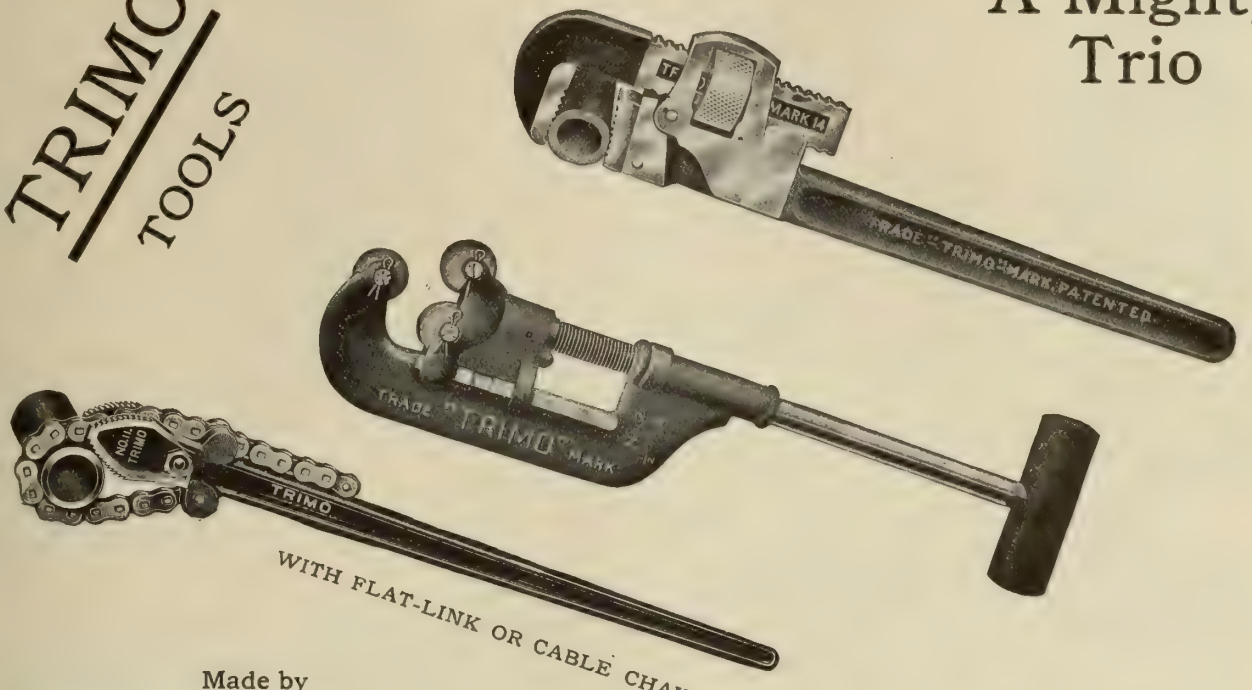
The Holden Company, Limited

42 York Street	354 St. James Street	291½ Portage Ave.
TORONTO, Ont.	MONTREAL, Que.	WINNIPEG, Man.

The advertiser would like to know where you saw his advertisement—tell him.

TRIMO TOOLS

A Mighty Trio



WITH FLAT-LINK OR CABLE CHAIN

Made by

Trimont Mfg. Co.

Roxbury, Mass.

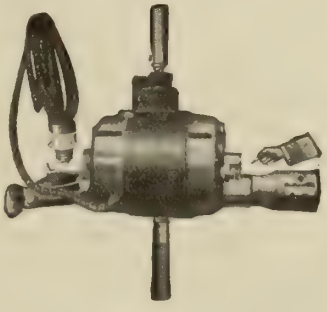
Send for Catalog No. 200

U. S. Electric Drills and Grinders

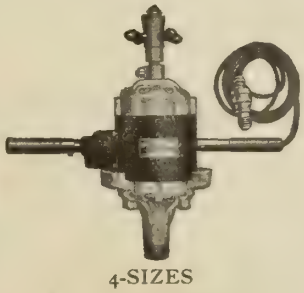
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



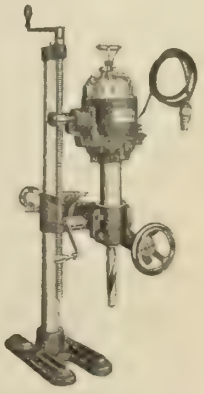
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

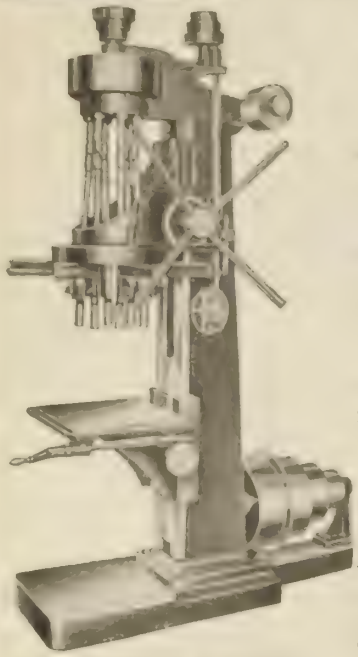
Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - - OHIO, U.S.A.

FOX

Multiple Spindle Drills



No 1 Drill—9-in. Round Head
6 -in. Drills

The No. 1 Drill illustrated can be furnished to drill the following holes in brass, cast iron or steel, drilling to a 9 in. circular, or a 9x12 in. rectangular or irregular layout:

4	¾-in. holes
6	⅝-in. "
8	½-in. "
10	⅜-in. "

We build machines for drilling motor bases, cylinders, crank cases and parts of similar character.

WRITE US TO-DAY FOR FULL INFORMATION

FOX MACHINE CO.

23 N. Front St., GRAND RAPIDS, MICH.

No Hammer, Spanner or Wrench required



Roller Bearings eliminate friction

THE RUSSELL Anti-Friction DRILL CHUCK

is easily adjusted by a simple turn of the wrist. and is remarkable for the tenacity with which it grips the drill.

Positively holds straight shank drills without slipping.

Send for catalogue

Distributing Agents in Canada

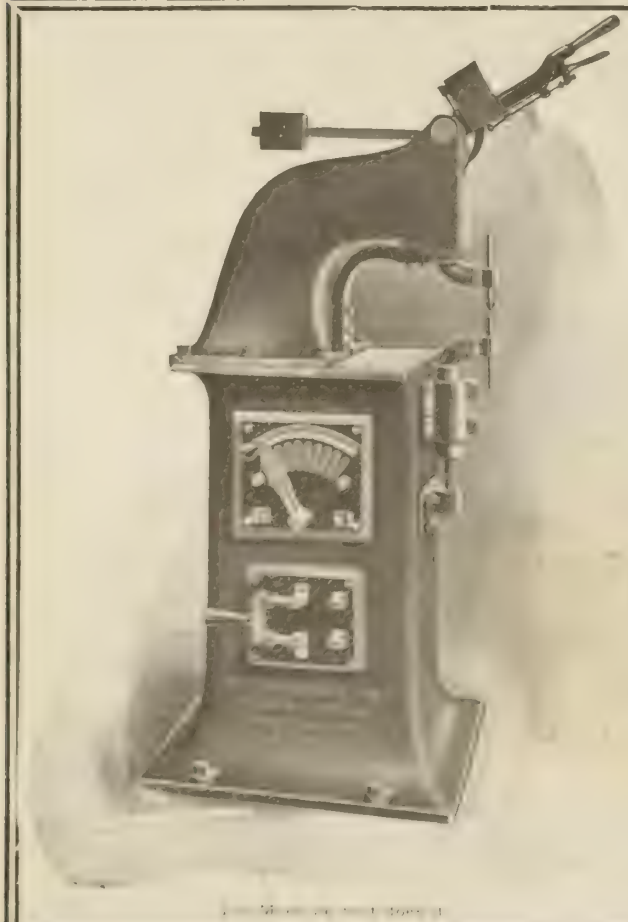
The General Supply Company of Canada Limited

Ottawa, - - - Canada

MADE BY

Russell Anti-Friction Drill Chuck Co.

ELMIRA, N.Y.



Riveting by Lightning

NO RIVETS USED.

You have heard of lightning melting a piece of metal.

That is what's done in a Spot Welder—only the lightning is tamed and harnessed. So tame that you can't feel it (only three to five volts), and harnessed to a machine that a boy or girl can operate with absolute safety. And FAST—well you have heard of "greased" lightning. That's the brand.

One "Spot" will weld two pieces of No. 18 gauge sheet steel together tighter than two rivets. The same machine will weld No. 10 gauge or No. 28 gauge equally as well.

Spot Welded—so called because the small point in the metal the size of a rivet is melted—fused together at the spot where the copper dies touch the metal.

No holes to punch no rivets to use—no projections to raise—no time wasted.

Our new catalog tells about spot and butt welders, and its yours for the asking.

No Lease. No Royalty. No License.

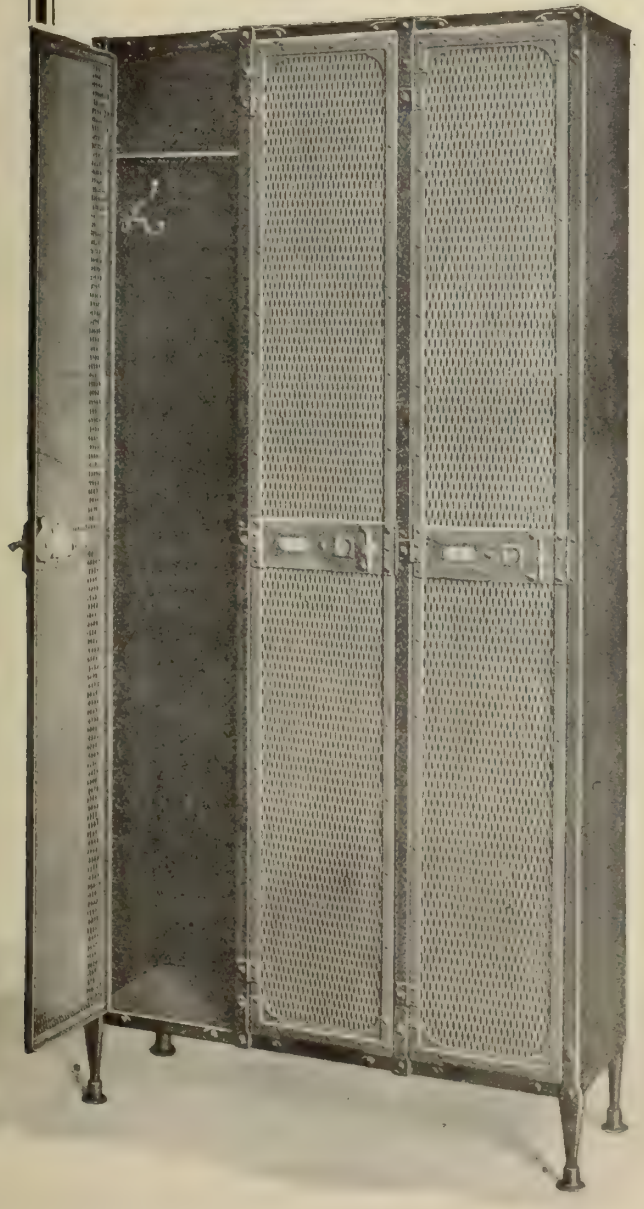
The "Toledo" Electric Welder Co.

CUMINSVILLE, CINCINNATI, OHIO, U.S.A.

Have you a Locker System in your Shop?

"D.L." Standard METAL LOCKERS

installed in your machine shop will, directly and indirectly, save you money.



They are sanitary, and protect your workmen from risk of contagion.

They are fireproof and fire retarding, and lower your insurance rates.

They provide absolute security against petty theft, and promote order and system.

They have specially well made doors and locking device, and each locker bears a distinctive number with corresponding key.

Unequalled for strength, durability and economy.

Send to-day for catalogue containing all information about "D.L." Standard Metal Lockers and Material Cabinets. Our prices will greatly interest you.

Dennis Wire & Iron Works Co., Ltd.

LONDON, - - CANADA

Don't fail to mention "Canadian Machinery" in writing to advertisers.

SHUTDOWNS PREVENTED

or at any rate made of extremely rare occurence by using

Write to-day for Details and Prices

Goodhue Belts

Guaranteed Reliable and Economical

—the belts that STRETCH LESS by 15% to 25% than any other leather belts on the market. Think also what a saving "Goodhue" Belts mean in belting, you can't use the short lengths taken out every time slack is taken up. All unstretched parts are carefully excluded in the make-up of "Goodhue" Belts, which in point of satisfactory and lengthy service have no superiors anywhere.

When "quality" is taken into account, "Goodhue" Belts will be found the cheapest on the market.

According to conditions under which the belt has to run we recommend :—

"EXTRA," "STANDARD" or "ACME WATERPROOF"

J. L. Goodhue & Co., Limited

DANVILLE, P.Q.

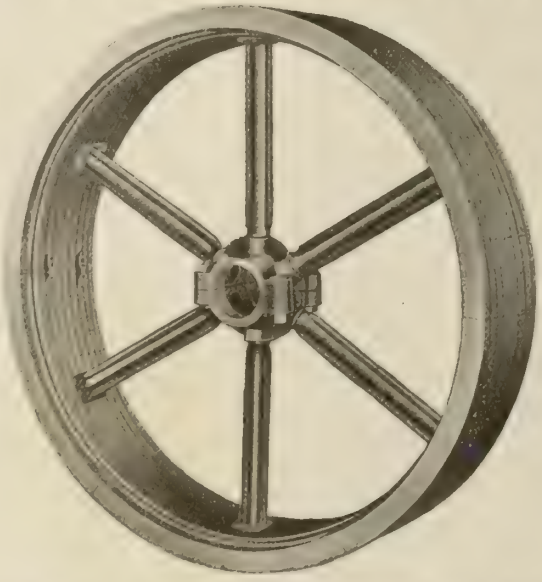
Why Buy Wood Pulleys When You Can Save Money By Purchasing

"POSITIVE" COMBINATION PULLEYS?

Waterproof Wood Rims

Pressed Steel Arms

Malleable Hubs



Will transmit more power and consume less power than any other pulley

EVERY PULLEY GUARANTEED.

Prompt shipments from stock. Write us for the opinions of users.

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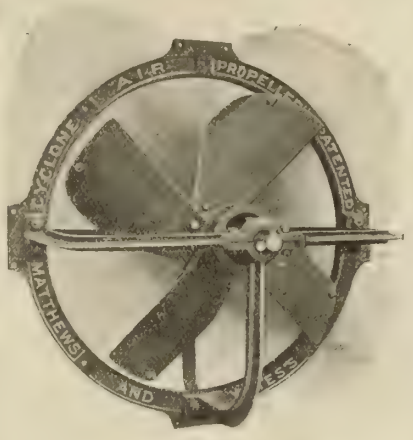
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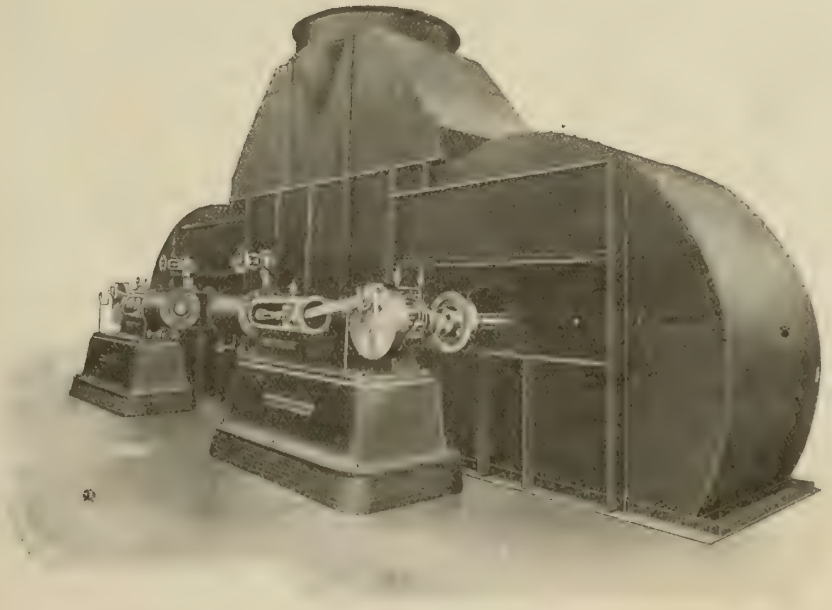
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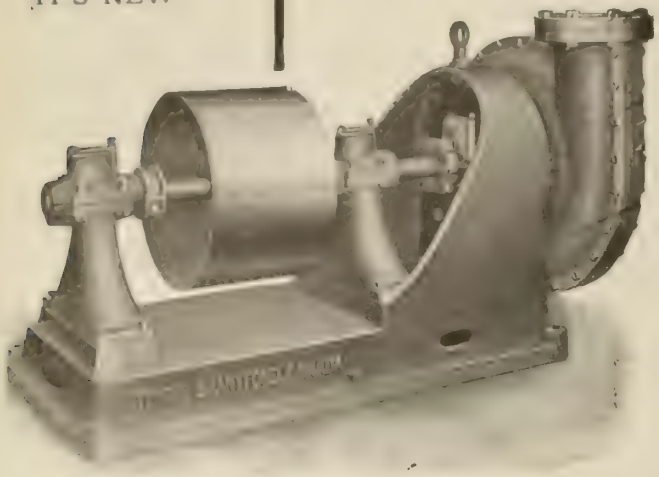
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The split-base is its special feature, permits the removal of the operating parts without disturbing pump foundation.

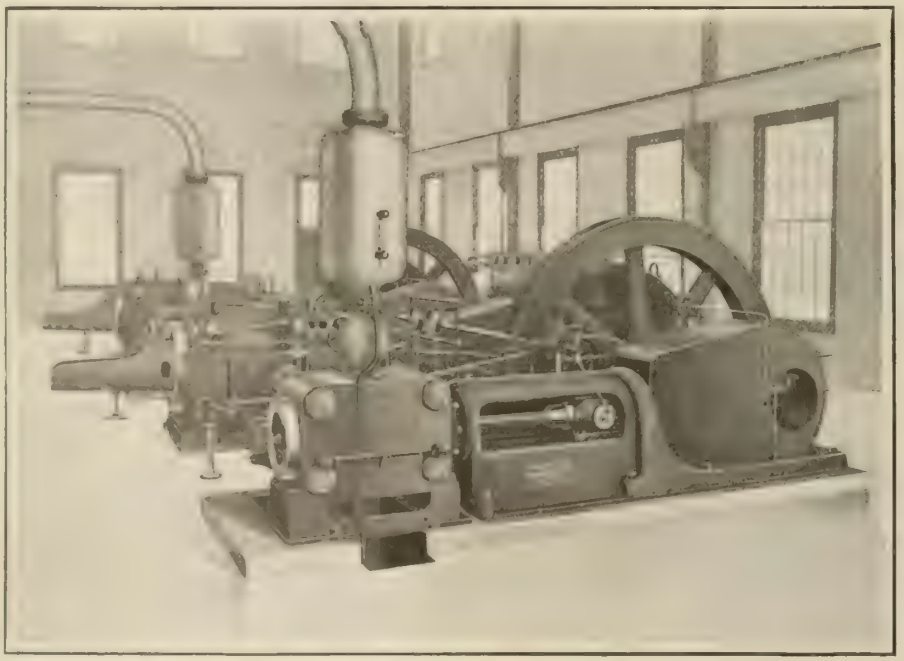
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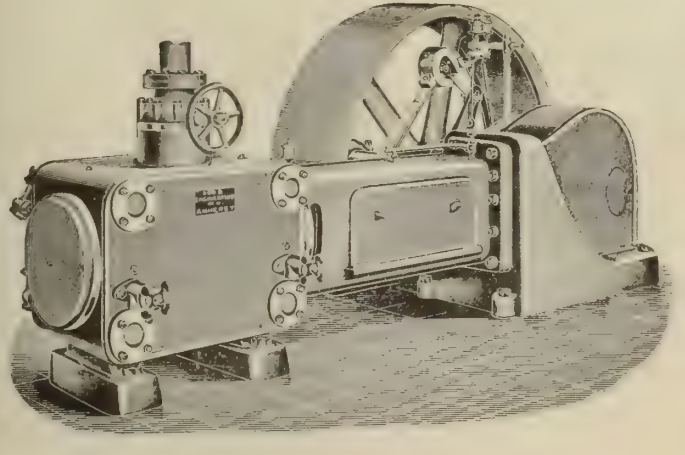
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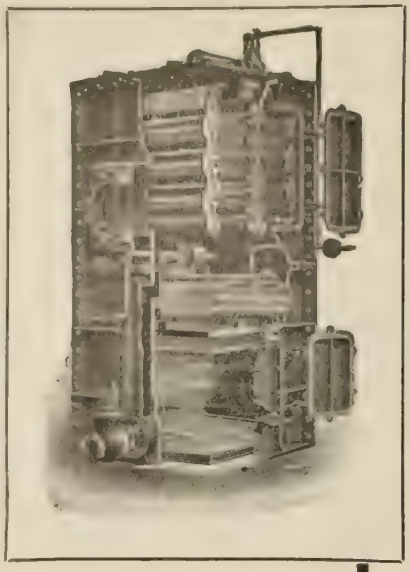
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Feedwater Heater, Purifier and Filter?

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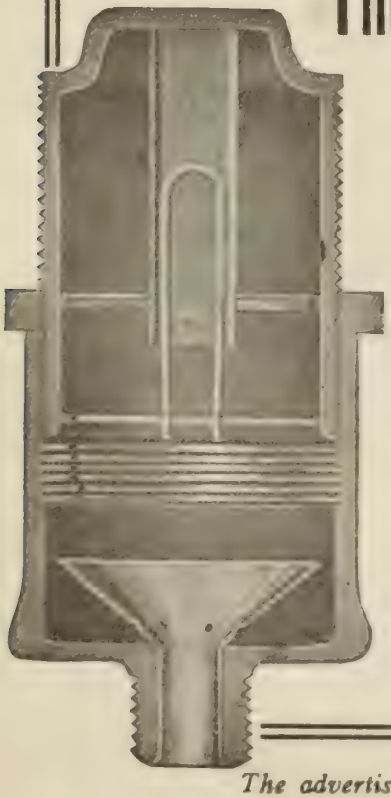
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Give the *PHILADELPHIA* a thorough trial. It has proved an invariable winner under whatever conditions used.

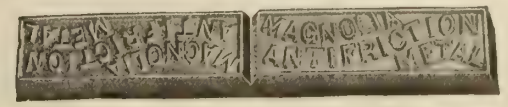
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Will sail rings around "Genuine" Babbitt at about half the cost per pound, and then save probably as much more in the reduction of frictional resistance, in longer wear, less fuel, less oil, less liability to squash or "shutdown" and less rebabbitting.

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Sounds Like Bragging, and It Is.

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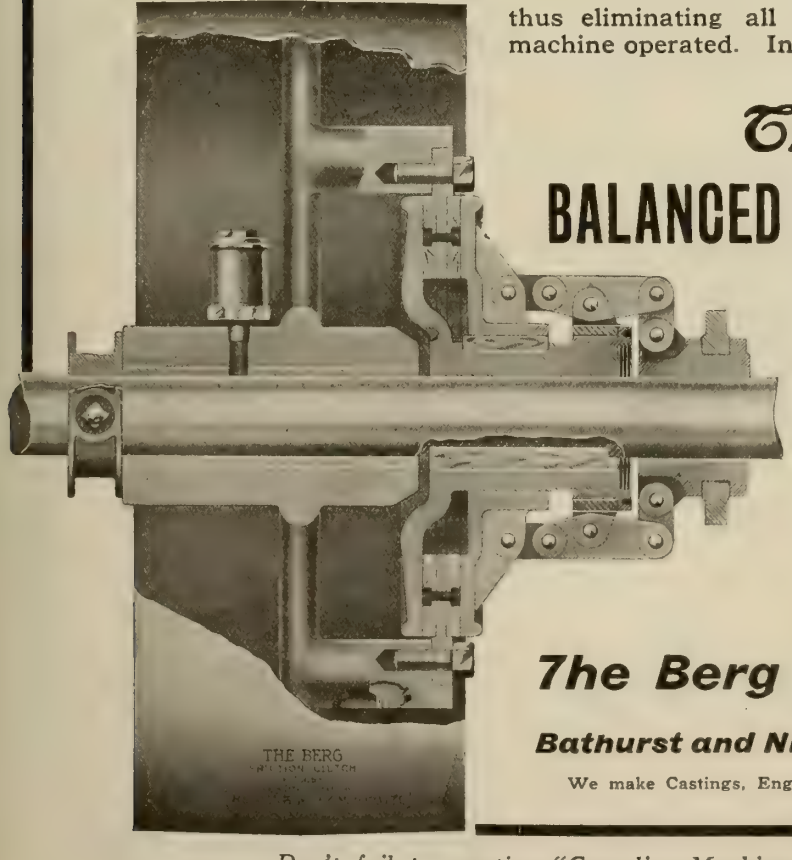
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has been used with theutmost satisfactionon over a thousand machines of various kinds.

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The difference between the cost of power at your engine or motor and at your machine averages from 20% to 70%.

This is wasted in friction.

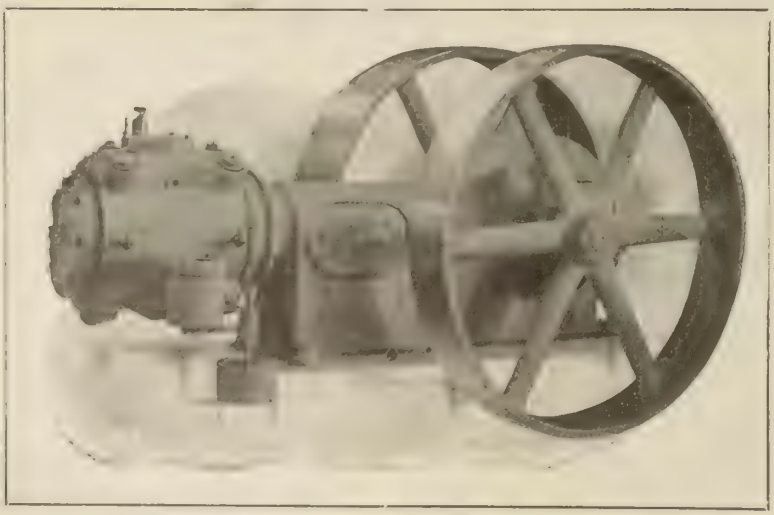
Chapman Double Ball Bearings are guaranteed to save 75% of this shaft friction and 95% of lubrication over any type of self oiling bearings.

They are now installed in over 1,000 Canadian factories. Send us a rough sketch of your shafting layout and we will advise you as to the amount of power that can be saved and the cost of installing Ball Bearings.

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AIR COMPRESSORS



THE illustration is of a RAND Class "N E-I" Straight Line Belt-Driven Air Compressor.

This is an economical, automatic, high-speed, self-contained machine, which represents the very latest development in small power-driven air-compressors.

The excellence of design and construction of these small machines is unequalled. Every part is just as carefully manufactured as the largest type of Corliss Compressor, and the result is a machine of unusual quality.

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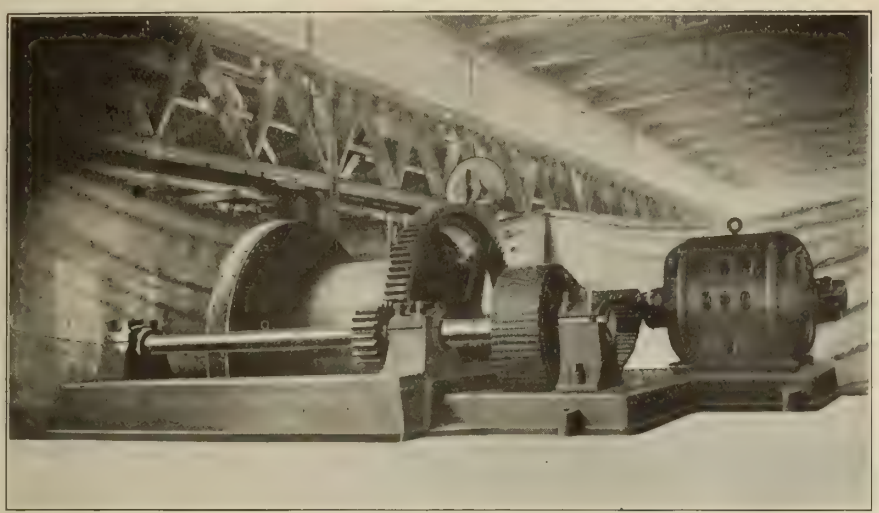
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Renold Patent Silent Chains

Hans Renold, Limited, Manchester, England, the Sole Mfrs. in the WORLD.



(A Renold Silent Chain driving a mine hoist from a 150 H.P. Motor. Centers 6 feet.)

Transmit at a high speed any power and do it as quietly as a belt with the certainty of gears.

Being positive, effect a continuous saving of power.

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By the TROPENAS CONVERTER PROCESS

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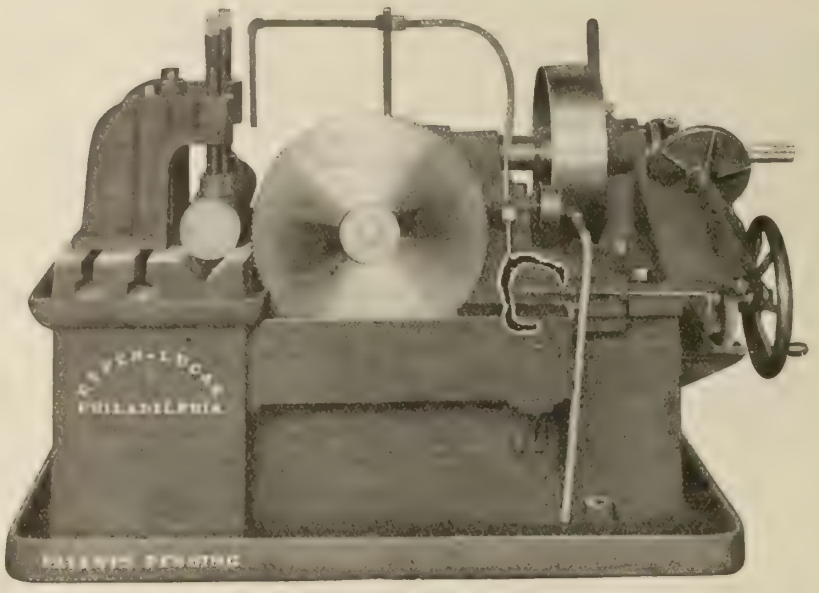
When new improvements at present under way are finished, we will have the most modern and best equipped steel foundry in Canada for the manufacture of steel castings up to 1,000 lbs. weight.

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THINK how many jobs you could do at REDUCED COST, with one of our cold saws. Many jobs are done on a Shaper, Slotter, Milling Machine or with a Hack Saw that could be done much more economically on one of these handy machines, leaving the other tools for the work they are particularly adapted for.

These Cold Saws can be fitted up with clamps for doing a great variety of work not only for general Machine Shops, but also Structural Shops; they will saw anything within the capacity of the saw.

They are of substantial construction, designed to withstand the severe strains developed when cutting through metal with a saw blade driven by powerful gearing.

Shall We Send You Catalogue?

The Canadian Fairbanks Company, Limited

Fairbanks Scales.—Fairbanks-Morse Gas Engines.—Safes and Vaults.

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Fig. 1 Finished Gun, Showing Mechanism.

Making a Double Barreled Shot Gun

By B. A. C.

The Shotgun is Such a Common Article That Few Stop to Consider How it is Manufactured. Gun-making has Become Such an Important Branch of Machine Shop Practice That There are in Use Many Special Machines to Facilitate Production, Not to Mention the Hundreds of Jigs for the More Expeditious and Rapid Handling of the Parts. The Only Shot-gun Factory in Canada, the Tobin Arms Mfg. Co., Woodstock, Ont., is a Thoroughly Up-to-date Example of What is Being Done in This Special Line of Activity, the Principals and Operators in the Factory Having Spent Years Developing Their Knowledge of This Special Line.

THE writer, when passing through the plant of the Tobin Arms Mfg. Co., Woodstock, was impressed with the multiplicity of operations necessary to produce even the seemingly most insignificant parts of a shot gun. To the casual observer, there is not much to a gun, but, if examined closely, it will be observed that quite a large number of parts enter into their make-up, necessitated largely by the more or less automatic action of the firearm, and also from the compact construction essential to a good gun.

This latter feature makes machining of the parts a considerable job, for from this compactness, every available space must be utilized, making many of the parts of unusual mechanical construction. Numerous distinct operations are required in most cases.

The frame of the gun shown at A, Fig. 3, affords a good example, for this part in itself requires 57 separate and distinct operations. Of course, this is the main part of the gun, and on it both figuratively and literally, the rest of the gun hinges. As with most of the other irregular parts, the frame is drop forged steel, and in the finishing, like nearly all the parts, the miller plays a very prominent part, being the principal machine employed.

A review of a few of the principal operations on the frame would be of interest in showing how a job like this would be produced. The first three operations are on the power miller, finishing up the two sides and back thereby squaring the piece for further operations. The next two operations are on what is called the "water table" at B and C. The two operations are necessary—too much for one cut. The first removes the flat face B, and the second, the perpendicular face C. Following this is a drilling and reaming operation on the joint pin hole D. The tang E receives the next attention being finished in the power miller under, above, and on the two sides in four successive operations. Next comes another power miller operation on the round joint end, which must of necessity be very accurate, of a true circular form. This is done by a formed miller, producing the work very rapidly. In order comes the lug cut F on the miller, which is the cut in the frame to hold the lug of the barrel. In succession follow the drilling, reaming, and slotting of the trip hole, finishing the recess G on each side in several operations by the hand miller, and the profiling of the lock cut, in the interior of the frame by the profiler. Between these various operations mentioned are many minor ones, principally drilling, slotting and broaching.

In all these varied operations, the point that stood out most prominently, was the expeditious manner in which they could be produced naturally. To make this possible, jigs, formed tools and milling cutters without number, are employed, many of them very intricate in form, but designed with the idea of simplicity of operation in view.

The fore end iron shown at H, Fig. 3, is another piece with a number of operations, 23 in all, of which the principal are the top face cut, two side cuts, wood cut, joint cut, all done on the the miller, and the drilling and broaching operations. The trigger plate, shown at A, Fig. 2, also has a number of different operations, the principal ones being on the hand miller. There are 19 in all. The upper cut shows the plate in its drop forged state, and the lower one, finished. B shows the frame and mechanism assembled, and C, the fore end iron in different stages of com-

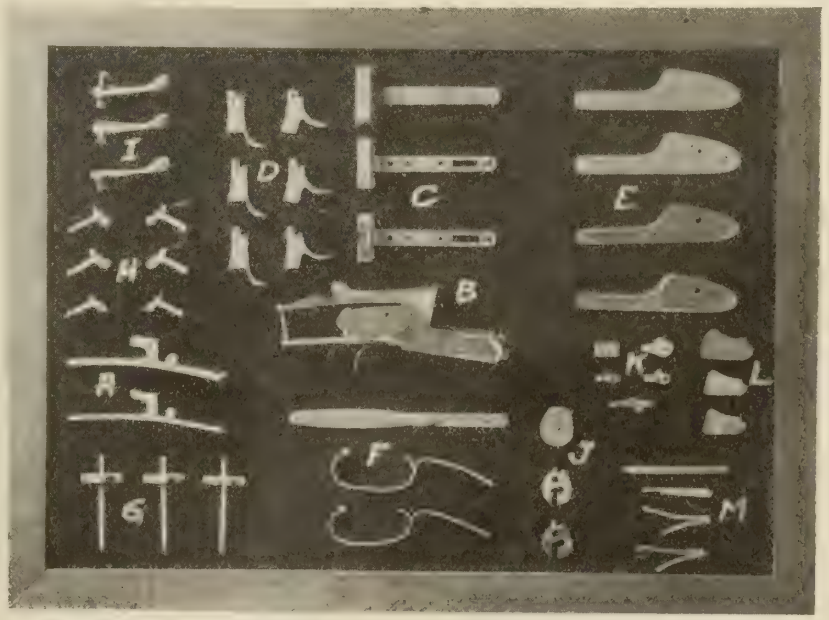


Fig. 2 Component Parts of a Shotgun in Various Stages of Manufacture.

pletion. The side view is given in Fig. 3. D shows the right and left trigger, in the different states of finish; E is the same for the lock plate, and F, the the trigger guard. For the latter it will be noticed that it is drop-forged in the flat state and then bent to shape. G shows the various stages of completion of the cartridge ejector; H, the right and left rear; I, the finished and unfinished top lever, (note the way it is drop-forged); J, the bolt; K, the cam lock and cocking cam in their various stages, and also assembled; L, the hammer; and M, the main spring, (note how it is produced).

Fig. 4 shows how the two barrels are united. Instead of being a solid, one piece forging, each barrel is finished to a certain point separately, and the two dovetailed together as shown, and brazed. This makes a very solid union, as the separting strain is not very great. After thus uniting, the final finish is given to the interior of the barrel in a special machine, where the finishing reamer shown in Fig. 5 is employed. It removes from .010 to .012 ins. in all, and must of necessity operate very slowly to prevent chatter, as the cutting edge presented is the whole interior length of the barrel. As shown the reamer consists of a square steel bar, three corners of which are dulled, and the fourth with a sharp edge, like a scraper. A shim of wood along one side (the proper side is indicated) makes the reamer fit the barrel snugly. Each operation removes but a very slight surface, and to change the size to remove more each time, very thin strips of tissue paper are introduced between the wood shim and cutting bar, increasing the size slightly. The cuts must be very small to obviate the before mentioned danger of chattering, as, once a chatter-groove is made, it is practically impossible to remove.

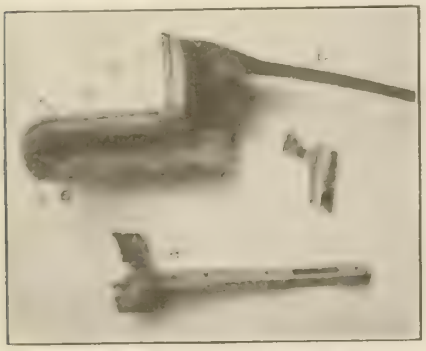


Fig. 3.—Frame and other Parts of the Gun.

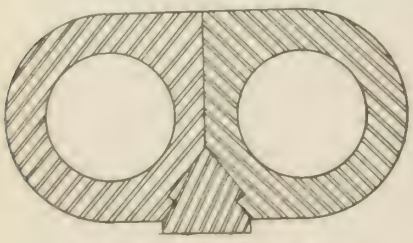


Fig. 4.—Cross section of Barrel.

Various other special machines and tools are employed reflecting credit on F. M. Tobin, vice-president of the company, and A. A. Lottery, superintendant, who installed the plant. It is due to these two men and particularly to the former, that there is at present a modern and efficient shot gun factory in Canada.

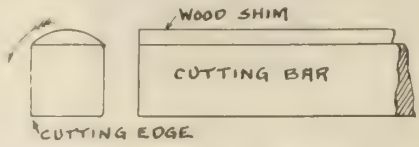


Fig. 5.—Finishing Reamer.

WIRE GAUGES SHOULD BE STANDARIZED.

A correspondent in "Scientific American" has called attention to the fact that there are some six or eight different gauges in use by the wire and sheet mills of the United States. There is often a difference of two sizes in the gauges, and a mistake in using the wrong gauge often results in a great deal of expense to one party or the other. If merely the size and not the gauge is given with an order, the mill must write back to ascertain the gauge, and much valuable time is lost. The writer suggests that either the manufacturers themselves should get together and decide on some one gauge, or the Government should take action in the matter.

NEW MACHINERY HALL.

An architect's drawing of the new machinery building for the Ottawa Exhibition Grounds, has been prepared. The building was designed by Mr. W. E. Noffke, architect. It will stand near where the old machinery hall is located, occupying the present roadway in front of that building. The lagoon in the exhibition grounds is to be filled up and only two small ponds with fountains in them will be left in front of the new building. The building will be 280 feet long and 140 feet wide. It is Japanese in architecture. The structure will have a steel frame and the outside will be of brick, built with Flemish bond. The trimmings and columns will be of concrete and the roof of red tile.

At the main entrance to the building will be Japanese towers, which will be illuminated with electric lights, forming two towers of light on either side of the doorway. There are also two Japanese towers on the roof also to be illuminated.

The columns in front and the gables will be treated in the best examples of early Japanese architecture. The floor will be of concrete and the inside walls treated in brick.

The canal runs at the rear of the building, which will be placed forward of the old bulding in order that the proposed route of the driveway may not be interrupted along the canal at this point.

BOLTS — SECTIONAL AREA UNIFOMITY.

By A. E. B.

Bolts that are subject to repeated shock and stress, those belonging to an engine connecting rod for example, give much more satisfactory service if the body is reduced in diameter to give an area corresponding to that of the bottom of the thread, or if a hole is drilled out to attain the same end.

With each shock there occurs a slight temporary elongation concentrated for the most part at the smallest diameter or area, i.e., the bottom of the thread between the nut and bolt body, Fig. 1.

The continuance of this condition leads to a crystallizing process being set up in the material, and ultimate fracture of the bolt, after it may be a brief service, irrespective of safe working calculation of sectional area.

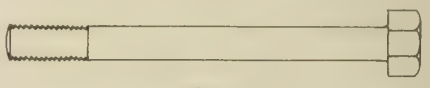


Fig. 1.

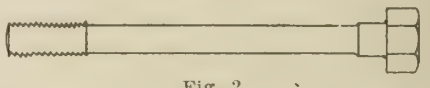


Fig. 2.

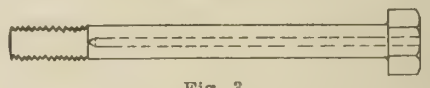


Fig. 3.

By reducing the area of the bolt body until it is equal to the area under the thread, the temporary elongation or stretching is distributed over a greater length and naturally the strain is less per particle of metal than otherwise.

Fig. 2 illustrates the bolt with the body diameter reduced, and Fig. 3 the bolt with the hole drilled into it. Both of these methods are in common use and each gives highly satisfactory results.

Preference is sometimes given to the method indicated by Fig. 3, for the reason that as it does not decrease the outer diameter, the twisting or torsional strength of the bolt is not impaired.

It is the practice in many cases to have this reduction of bolt area particularly referred to in specifications, and its more frequent adoption in general practice would be conducive to immunity from breakdown.

The McClary Manufacturing Co.'s "Welfare" Department

By Blackrock

A Growing Tendency is Being Manifested Among Large Employers of Labor in the Direction of Improved Social Conditions for Their Employees. The Movement is One Which Naturally Meets With the Approval and Hearty Co-operation of the Latter, and While Only Just in its Infancy and Experimental Stage, Gives Promise of Far-reaching Results in Producing Amicable Relations Between Capital and Labor.

THE McClary "welfare" department was organized about a year ago on the initiative of the company, which step ranks them among the pioneers in the opening up of this field of factory social extension and development. "Welfare" as applied to employes is interpreted to mean "anything done by an employer for the benefit of his employes, which he is not compelled by law or expected by custom to do."

Features of the Work.

At the foundry plant in the east end of the city (London, Ont.) is to be found a perfectly equipped emergency hospital, and at their wares plant in the centre of the city is to be found a similarly equipped institution.

A graduate nurse is employed by the department and devotes her whole time to the cause. She gives advice as to the sanitary conditions existing throughout the plants, gives first aid assistance in case of accidents, dresses the wounds of such persons until completely recovered, and visits employes at their homes in sickness.

During the year just closed the nurse (Mrs. Reynolds), attended 26 accidents, made 619 dressings, and paid 240 sickness visits. In addition to the nurse, attendance and service, a doctor visits the factories daily at the noon hour.

Lunch Room, Library, etc.

At each plant there is a cafe under the care of an experienced chef. Here wholesome food is supplied at cost to all who care to avail themselves of it. A daily average of 360 lunches are served, and separate lunch and rest rooms are provided for girls.

In winter, games, entertainments and lectures are provided at the noon hour, while in summer outdoor recreation in the form of tennis and baseball are the features.

McCLARY'S

WELFARE DEPARTMENT

¶ This List must be placed in the box in each department by ten o'clock each morning, in order that the person in charge will have ample time for preparation.

¶ Mark what you want, total the amount, sign your name and date.

BILL OF FARE

FRUIT IN SEASON

SOUP	3 cents.
SANDWICHES	3 "
EGG SANDWICHES	5 "
PORK AND BEANS	3 "
BANANAS	2 "
TEA	1 "
COFFEE	1 "
MILK	2 "
HOT OXO	3 "
BREAD AND BUTTER	1 "
PIE	4 "
HOT WATER	1
TOTAL	

Date 1911

Name .....

Each plant is equipped with a library, supplemented by loans of books from the public library of the city. A fee of one cent per week is charged for the loan of a book, which fee is put into a new book purchase fund.

Fig. 1 is a view of the emergency hospital; Fig. 2 that of the library, each being intensely realistic of its particular purpose. The library boasts 633 volumes on its bookshelf.

Report of the Work.

The annual general meeting of the welfare department was held on Monday evening, 6th February, at which gratifying reports of the previous year's work were presented, and office bearers for the ensuing year appointed.

Col. W. M. Gartshore, vice-president of the company, and J. K. H. Pope, secretary, are chairman and vice-chairman of the welfare executive respectively, the other members being drawn from the various departments.

A striking phase of the work is the enthusiasm displayed by Col. Gartshore and pride taken by him in what has been already achieved, as evidenced in his availing himself of the daily lunch when opportunity offers.

A Progressive Ideal.

Effort of this nature is progressive if successful, in that one feature leads to another; this being so, additional ground is sure to be broken during this second year of institution. Too much has not been attempted to begin with, just sufficient as it were to prove it to have been worth while.

Work such as we have described is not in any sense charitable, its essence is not the giving of something for nothing; it is rather an educative, elevating and humanitarian purpose, having in view the cultivation of a spirit of help-



Fig. 1—Emergency Hospital, McClary Mfg. Co., London.



Fig. 2—Library, McClary Mfg. Co., London.

ful, thrifty and honest man and womanhood.

We look for the example of the McClary "welfare" department being imitated in other manufacturing centres of the Dominion, and it is not too much to expect that as the scheme develops, there may at least be provincial executive boards who will meet to discuss and further this co-operative movement of capital and labor.

The McClary Booster Club.

The McClary booster club is really an offspring of the welfare scheme, and exists to provide healthful amusement and entertainment on stated occasions to the employes and public. The meetings are held in the company's large dining hall, and consist of smoking concerts, illustrated lectures, dance and euchre parties.

George Moll, chief engineer of the wares plant, is president, and as in the case of Col. Gartshore and the "welfare" scheme, not a little of the booster club's success is due to him. The admission to the meetings is restricted to 10 cents, an amount entirely disproportionate to the quality of entertainment usually given.

"The Free Press," London daily, has donated a trophy to be awarded the society which has done or is doing most for the city's welfare. The booster club is entered, and high hopes are entertained that "McClary's" will be the judges' selection.

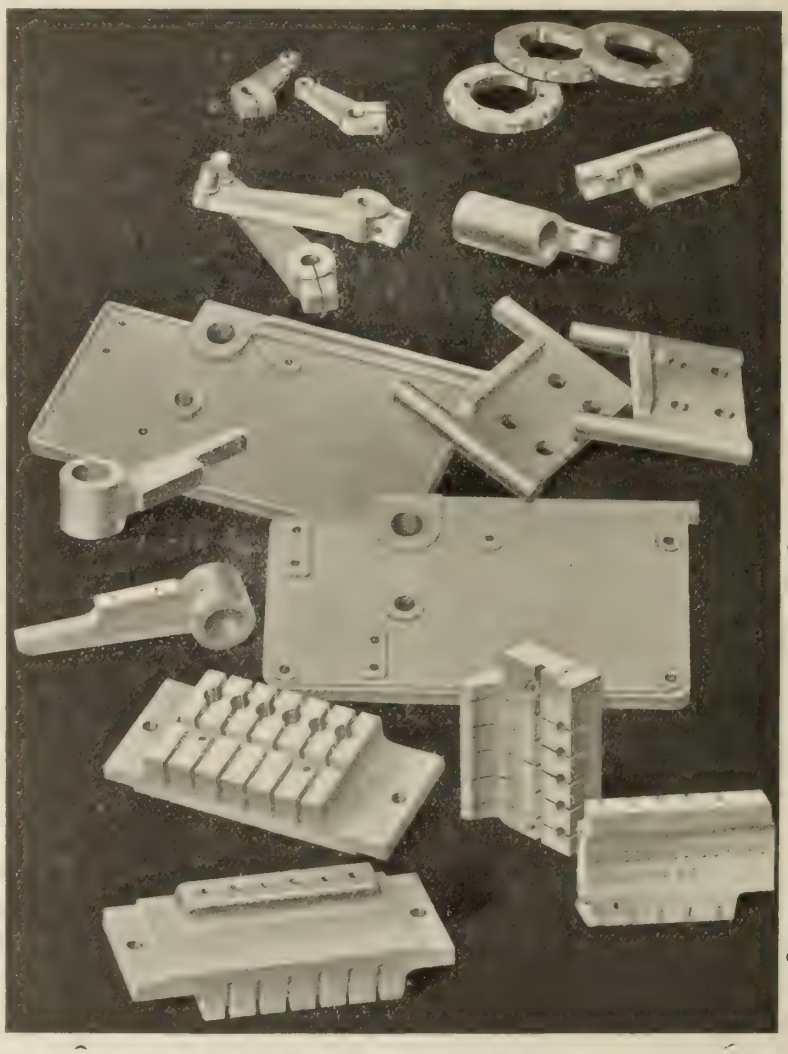
This article has featured at some length an excellent work that is being done by the co-operation of employer and employe, and we hope to continue the series by describing from time to time other concerns engaged in a like worthy compact.

DIE CASTING.

ONE of the most successful of the modern methods of manufacture and one which has created considerable interest of late, is that commonly known as diecasting. The Franklin process was originated about eighteen years ago by the H. H. Franklin Mfg. Co., Syracuse, N.Y. In the Franklin process steel dies are used in the place of sand moulds and into these dies the molten metal is forced under pressure, by means of especially designed machines. This results in smoothly finished castings accurate to the thousandths of an inch and with holes, slots, lugs, large threads and engraving accurately located. In fact the accuracy obtained by this method of manufacture is in many cases greater than can be secured by machining. Tin, zinc and lead based alloys are most commonly used, the normal strength being about that of cast iron, but the castings may be further strengthened by the inserting of brass or steel stampings, pins, etc., in the process of casting, wherever special toughness is required. In general, die castings range from 1-16 of an ounce to 4 lbs. in weight.

The extent to which the process has gained favor can be seen by the fact that 64,000 Franklin die castings were used in the construction of the 1910 census tabulating machines, used by the U.S. Government. The automobile industry has also found die castings of great advantage; engine bearings, oil and water pump, timer and magneto parts are produced chiefly by this process. Small gears, type wheels, telephone, electric and vending machine parts lend themselves readily to die casting. Many parts which if produced by the usual machine methods would have to be made up in sections and assembled may be die cast as a unit. In such cases the saving is especially noticeable.

The steel dies used in the construction of die casting must of necessity be very accurate in order to secure the desired results, and none but the most skillful workmen can be employed in their manufacture. As a result of the die cost, die castings are at present better known in the United States where the quantity of duplicate parts used is much greater, but many of the Canadian manufacturers are beginning to realize the benefit resulting from their use in even moderate quantities.



Parts Cast by the Franklin Process and used by the U. S. Government in the Construction of the 1910 Census Tabulating Machines.

SHEELITE.

Sheelite, one of the minerals containing tungsten, has been discovered in Halifax County, Nova Scotia. It is of no known use in itself, excepting as an ore from which tungsten may be extracted. The mineral is chemically a tungstate of calcium. As an ingredient in the chemical side of steel making, it is quite important. At present the world's annual output, coming mostly from Sweden, is placed at 4,000 tons. If present indications are correct, the recent discovery in Nova Scotia will not only yield sufficient for the steel plant in the province, but will have an effect on the markets of the world. The ore is reported to yield 60 per cent. of tungsten acid to the ton of sheelite. At present 25 men are at work on the preliminary experiments. Hiram Donkin, deputy commissioner of mines, Halifax, Nova Scotia, will, give interested parties all reasonable information.

Pneumatic Appliances at the G. T. R. Car Shops, London, Ont.

By Halyard

The Opportunity for the Introduction and Development of Methods and Devices Toward Quicker, Less Laborious and More Economical Output, Exists to a Lesser or Greater Extent in Every Manufacturing and Repair Plant. We are Not Assuming Too Much in Stating that Possibly Those Plants Devoted Entirely to Repairs and Renewals Give Wider and More Effective Scope to Inventive Genius Than do Others of New Production Only, in That "Stern Necessity, the Mother of Invention," Demands the Exercise of the Highest Ingenuity and is Unsatisfied With Less.

THE sketches and description of the appliances which form the subject of this brief article were gathered in the course of a few hours' sojourn in the G. T. R. car shops, London, Ont., and while perhaps in no sense displaying hitherto unknown features, and being peculiarly adaptable to the special character and necessities of the work there, the great bulk of our readers will we are sure be interested, and modified arrangements of some or all of the appliances described, will possibly find adaptation by them in new fields.

It is to be borne in mind that these various appliances are in no sense standard, nor is it intended they be adhered to strictly in arrangement of detail by those interested to the extent of adopting them. The aim is rather to show in a general way a few of the uses made, as ideas developed in a particular shop piped with compressed air for other and what might be termed more important and primary purposes. That being so, modifications, improvements and entire change of design will in all probability suggest themselves to many, and new appliances arise from the cue given.

As hinted in the preamble, repair and renewal shops are prolific of inventive genius. Break-downs and smash-ups necessitate most always rush putting-to-rights again, to attain which requires keen discernment of the right and best thing to do and the most helpful and often improvised equipment to do it.

Many methods and devices employed on such occasions are carelessly and thoughtlessly lost track of daily, and the profession is the poorer for it. An insufficient realization of their intrinsic worth by those giving them conception and an all-absorbing desire on the part of the administration to get things going again, combine to bring about the want of record referred to.

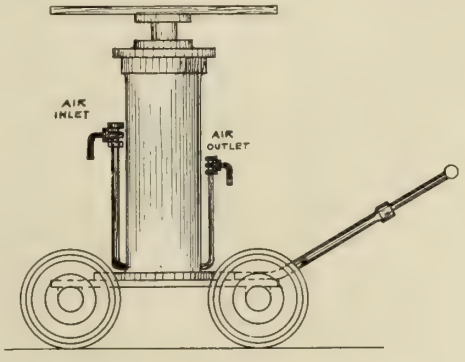


Fig. 1—Draught Timber Placer Jack.

We would like to digress a moment here and say that methods used by a mechanic to produce a piece of work of super quality, most economically, when made a regular practice of, are devices worthy of a place in the columns of this journal, and while lightly thought of and considered unimportant by the user, from a publicity standpoint, show themselves otherwise in the persistency with which they are adhered to and applied in practice. This is a point worthy the serious consideration of all engaged in the mechanical arts. Further, publicity given your methods and devices while admittedly helping the other fellow along, ultimately helps you, as he too has something to give.

The result of this distribution of ideas spells progress, progress leads to perfection, comfort and comparative affluence of the vast majority, and your duty lies that way.

Portable Draught Timber Placer Jack.

Fig. 1 represents the portable draught timber placer jack, and as its qualification implies, is used for running in underneath the cars, pushing the draft timber into place and holding it there until it is bolted up. The air cylinder is 5 inches diameter, the trolley wheels 8 inch diameter, 15 inch centres and the extreme width of truck 20 inches. The cylinder may be either a casting with upper head bolted or screwed on, or a piece of heavy wrought iron pipe bored out, with both heads screwed on. The lower head is bolted to a steel plate base which in turn is attached to the trolley wheel axles. On top of the piston rod a steel plate, 8 inches by 18 inches, is attached for the purpose of carrying the draught timber.

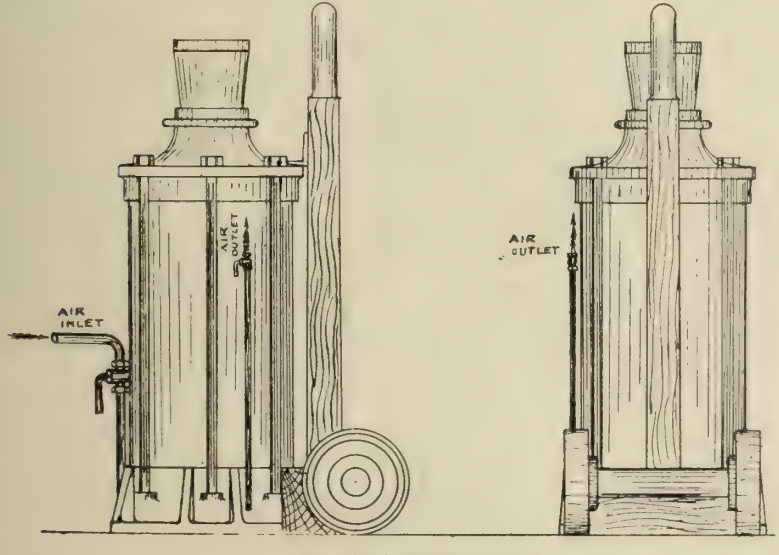


Fig. 2—Car-lifting Jack.

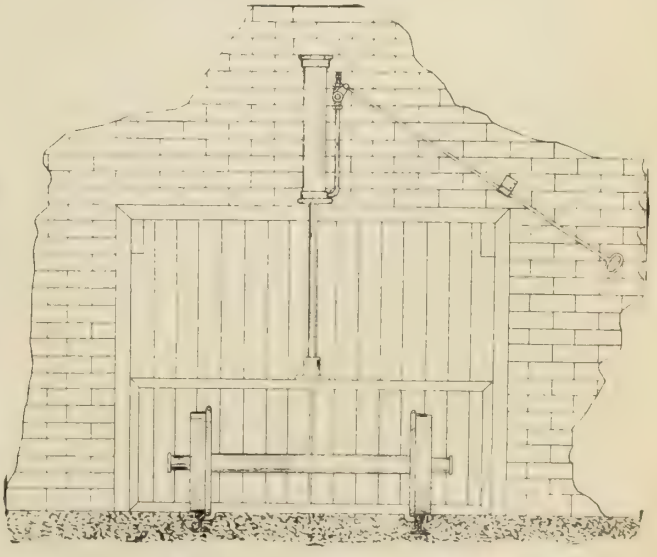


Fig. 3—Door Section Lifting Apparatus.

Car Lifting Jack.

Fig. 2 is representative of the car-lifting jack, and is necessarily heavier and more powerful than the other. The

cylinder diameter is 10 inches, and its purpose the bearing of a part in lifting empty freight cars off the trucks. Its base rests on the ground when in action, and for convenience in moving it around one pair of wheels and a heavy shaft complete the transportation facilities.

Door Section Lifting Apparatus.

Fig. 3 is an arrangement peculiarly

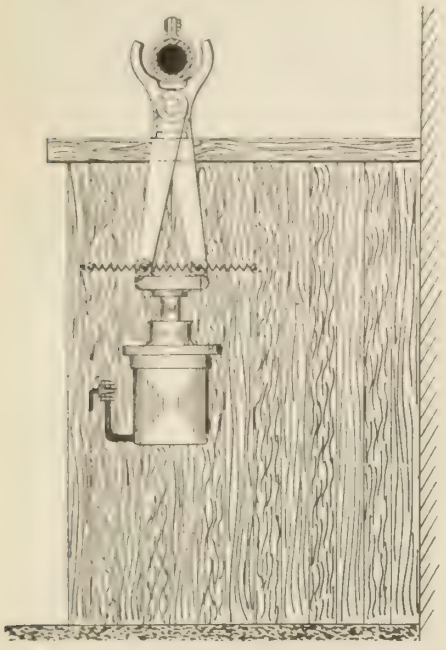


Fig. 5 -Air Brake Hose Clasping Device.

adaptable to railroad and street car shops. The door section lifting apparatus permits of the complete wheels and axles, trucks for that matter of it, being let out or taken into the shop without the necessity of opening the whole large door in cold and stormy weather, a proceeding which is more or less clumsy and slow.

The cylinder diameter in this case is made large enough together with the pressure to carry up the door section required, and the piston stroke long enough to suit the height of lift.

The operating lever to the right of the sketch enables the attendant to manipulate the aparatus with the greatest of ease. The lever actuates a 3-way cock allowing air admission to lift the piston, air shut-off to hold it and the door in position, as long as necessary, and air release to allow the door to close again. The cylinder details in this, as in the others described, may be all castings or part wrought iron pipe and part castings.

Air Brake Hose-Nipple and Coupler Inserter.

Fig. 4, the air brake hose nipple and coupler inserter, consists of a vertical acting air cylinder which clamps the standard length of hose, and the horizontal air cylinder with the nipple on its piston rod, which pushes the nipple into place, thereafter sliding the vertical cylinder and clamp endways toward the die block in which is laid the coupler. The horizontal movement pushes the hose onto the coupler.

The cylinders are in each case about 6 inches diameter, the vertical cylinder and standard being attached to the lower half clamp which in turn slides on four slot hole guide studs inserted in plate attached to an ordinary vice bench. Air admission and release is applicable to both ends of each cylinder.

Air Brake Hose Clasp.

Fig. 5 represents the air brake hose clasp attached to the end of the bench and adjacent to the nipple and coupling inserter. It consists of the air cylinder, piston and piston rod, the latter with a cap to opposite sides of which each half of the lower end of the squeezers is attached to permit of oscillation. From these centres light spiral springs are carried to and on opposite sides of their respective squeezer arms. These springs admit of the jaw grip being released when the air is released, and prevent a clasped downward pull when the piston descends.

The sketch otherwise is self explanatory and need not be dwelt upon. The advantage of the apparatus is that the clasp or band flanges are closed up, admitting of the bolt being inserted and the nut tightened up by hand. A spanner to tighten the nut is unnecessary, because although only applied by hand, the slight reactionary spring due to the withdrawal of the jaw grip locks the nut tight.

The saving of labor in the equipment of air brake hose by the sketch arrangements, Fig. 4 and 5, is 100 per cent. gain in economical production, and we should say were it possible to compute, an equivalent gain and comfort of operator.

Employes' Welfare.

In a near future issue of Canadian Machinery we hope to describe the arrangements made for the welfare of the employes in the G. T. R. car shops, London, Ont., believing also that these will be found of much interest to all our readers.

Much of the development and adaptation of suitable labor saving equipment as also the initiation and successful outcome of the employes' industrial and social welfare scheme is due to efforts of Mr. Thos. A. Treleaven, master car builder, to whom we are indebted for the opportunity of acquiring the foregoing information.

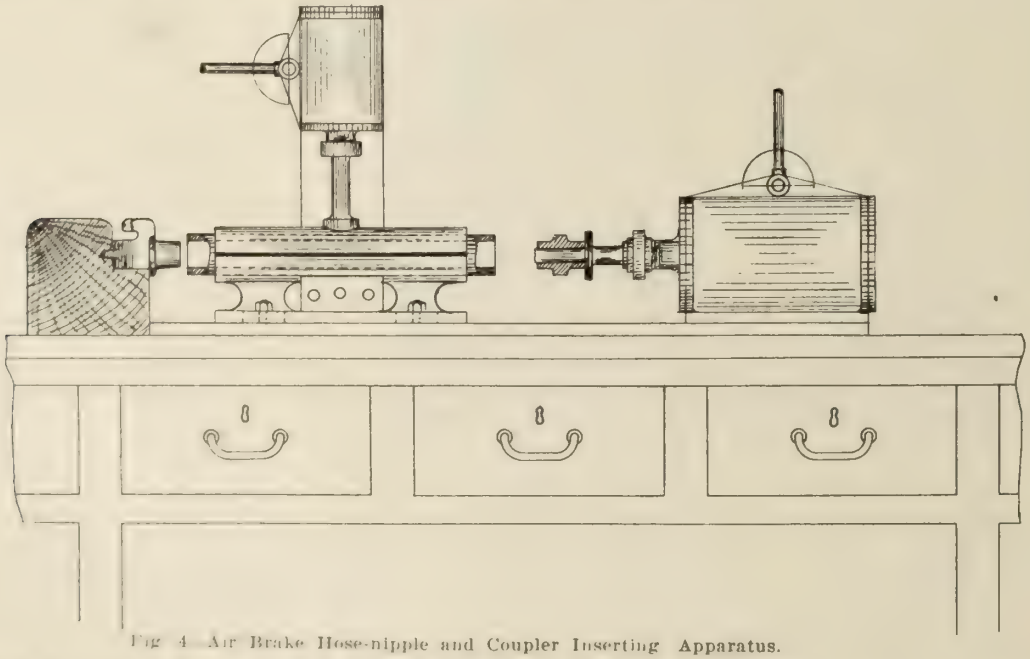


Fig. 4. Air Brake Hose-nipple and Coupler Inserting Apparatus.

Twist Drill and Other Internal Cutting Tool Practice

Modern Shop Practice has Developed Various Types of Twist Drills, Reamers, Counterbores, etc., Greatly Increasing the Capacity of the Machines Using These Small Tools. The Breakage of Tangs Formerly Caused a Great Loss, But This has Now Been Eliminated by Modern Methods.

ONE of the most common small tools in the machine shop is the twist drill, and it is probably the most abused. When a young fellow begins work in a machine shop, either as an apprentice or as a machine hand, the first work is usually drilling. He is led over to the drill, given a jig and a drill and told to "drill these."

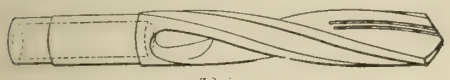


Fig. 1—Hollow Drill.

What the young chap does not know about drilling and shop methods would fill volumes. In the ordinary Canadian shop there is no central tool room, and the young chap is strictly "up against it." It is at this stage that the young fellow learns many things about drilling that he must "unlearn" later.

When the writer entered the machine shop he was given the job of milling tie pins for three months. For this he received fifty cents per day. About that time there was a call for volunteers for the Halifax garrison and it made a number of vacancies in our own shop. The writer was given the task of drilling malleable guards at seven cents per hundred, and malleable rings at twenty and twenty-five cents, and it was understood that he could make $1 to $1.25 per day. At the same time another apprentice was given the job of drilling pins. He had an old drill situated near mine with a big lever and a sliding table instead of the spindle and sleeve type, but made a dollar a day drilling pins at from five to ten cents per hundred.

We were located away from the rest of the shop and with the exception of rough emerys for grinding the burrs off the gray iron and malleable castings, there were no tool grinders within three or four hundred feet. It meant a big

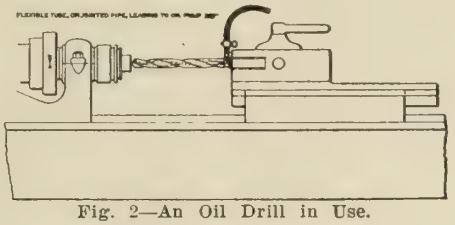


Fig. 2—An Oil Drill in Use.

loss to us to go down there every time we wanted to sharpen a 9-64, a 3-16 or a 7-32 inch drill as the case might be. We solved the difficulty by filing off the side of an emery wheel close to the centre and succeeded in making a good job out of one that had formerly been looked upon as one of the worst in the shop.

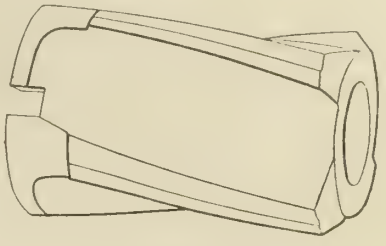


Fig. 3—Shell Drill.

Since that time the writer has been interested in the progress of drilling. Some data which would have been valuable in the old shop days, has been collected and some extracts from the pages of the diary are here given.

Some Types of Drills.

The twist drill of standard form is made with two lips and two grooves, which either make a constant angle with the axis or one which increases gradually from the point upwards. The increased twist is given in order to counteract the thickening of the web from point to shank, imparted to resist the

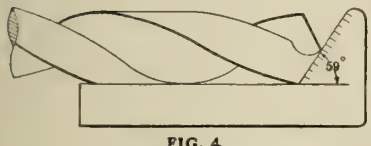


FIG. 4

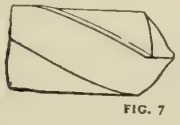


FIG. 7

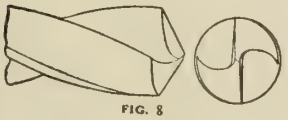


FIG. 8

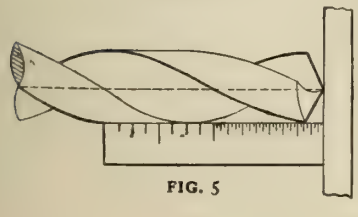


FIG. 5

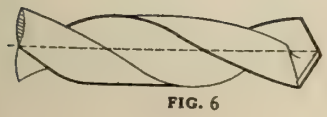


FIG. 6

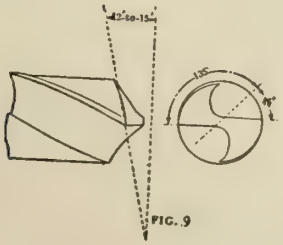


FIG. 9

TABLE OF DRILL FEEDS

Diam. of Drill	Inches of Feed per Minute at Cutting Speed of								
	30 Feet–Steel			35 Feet–Iron			60 Feet–Brass		
	Rev. per Minute	Feed .004-.007		Rev. per Minute	.004-.007		Rev. per Minute	.004-.007 per Revolution	
1/16	1834	7.33	12.83	2140	8.56	14.97	3668	14.66	25.76
1/8	917	3.66	6.41	1070	4.28	7.49	1834	7.33	12.83
3/16	611	2.44	4.27	713	2.85	4.99	1222	4.88	8.58
1/4	458	1.83	3.20	535	2.14	3.74	917	3.66	6.44
		Feed .007	.015		.007	.015		.007	.015
5/16	367	2.57	5.5	428	3	6.42	733	5.14	11
5/16	306	2.14	4.6	357	2.5	5.35	611	4.28	9.2
7/16	262	1.83	3.9	306	2.14	4.58	524	3.66	7.8
1/2	229	1.60	3.43	268	1.87	4.	459	3.20	6.86
5/8	184	1.28	2.75	214	1.50	3.21	367	2.57	5.5
3/4	153	1.07	2.3	178	1.25	2.67	306	2.14	4.6
7/8	131	.91	1.95	153	1.07	2.29	262	1.88	3.93
1	115	.80	1.71	134	.93	2	229	1.60	3.43
1 1/8	102	.71	1.53	119	.83	1.79	204	1.43	3.06
1 1/4	91.8	.64	1.37	107	.75	1.61	183	1.28	2.75
1 3/8	83.3	.58	1.25	97.2	.68	1.45	167	1.17	2.51
1 1/2	76.3	.53	1.15	89.2	.62	1.38	153	1.07	2.3
1 5/8	70.5	.49	1.05	82.2	.57	1.23	141	.99	2.11
1 3/4	65.5	.45	.97	76.4	.53	1.15	131	.94	1.96
1 7/8	61.1	.42	.92	71.3	.50	1.07	122	.85	1.81
2	57.3	.40	.85	66.9	.46	1.	115	.80	1.73
2 1/4	51	.36	.71	59.4	.41	.89	102	.71	1.53
2 1/2	45.8	.32	.68	53.5	.37	.80	91.7	.64	1.37
2 3/4	41.7	.29	.62	48.6	.34	.73	83.4	.58	1.21
3	38.2	.27	.57	44.6	.31	.67	76.4	.53	1.15

Fig. 10 Table of Drill Feeds.

tortional stress to which the drill is subjected.

A centre drill is a short twist drill used for centring shafts before facing and turning. Sometimes a combined drill with a 60 degree taper is used to drill the shaft and countersink it at the same time, thus avoiding two operations.

Hollow Drills.

Fig. 1 shows a hollow drill used for drilling long holes such as lathe and

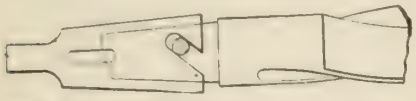


Fig. 11—Driving Broken Tang Drill.

drill spindles. The shank can be threaded and fitted to a metal tube of a length to suit the work.

Fig. 2 is another type used when the work revolves and the drill remains stationary. The oil cup is connected to the oil pump, forcing out the chips and keeping the point cool by a steady stream.

A shell drill is shown in Fig. 3. It is used for reaming out holes after a standard drill or cored holes. The arbor is the same for several sizes, so that the cost of shell drills is comparatively small.

A similar method is used so as to obtain the benefits of high speed steel at low cost. Drill tips are made with a small shank of about ¾ inch which is

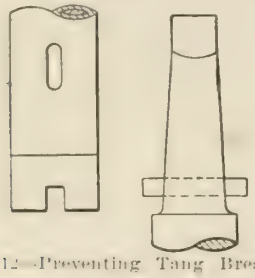


Fig. 12—Preventing Tang Breakage.

threaded. This size is adopted as standard for the shop and any size drill fits one shank which is tapped to suit. The same practice is followed for reamers.

Sharpening Drills.

With a drill the hole may be cut "oblong" if or much larger than the drill. A user of drills should therefore be familiar with the manner of grinding a drill to cut the right size with as little power as possible. To cut right the right size the lips must be exactly the same length and the same angle. Fig. 4 is a gauge which gives the lip edge angle of 59 degrees and at the same time assists in getting the true centre.

Fig. 5 is a gauge which shows how to get both lips alike, but does not give the angle.

In Fig. 6 the drill has been relieved back of the cutting edge, making it similar to a flat drill. As the drill wears down, it is often necessary to thin the point as shown in Fig. 8. This results in doing quicker and better work.

The angle of the point forms an angle of 135 degrees with the cutting edge as shown in Fig. 9. The best clearance for drills is from 12 to 15 degrees depending on the hardness of the metals, the greater clearance being used on the softer metals.

Drill Speeds.

In addition to a knowledge of grinding, the user should learn to run drills at proper speed. He will then require to grind seldom and will have few breakages. For steel use a speed of 30 ft. per min.; for cast iron, 35 ft. and for brass, 60 ft. per min. For drilling steel with a 1-16 inch drill, this means 1834 r.p.m., while for brass it would mean 3668 r.p.m.

The table, Fig. 10, taken from the American Machinists' Handbook, gives the speeds for all drills up to 3 ins. These speeds require plenty of lubricant and are for carbon steel drills. High speed steel drills will stand about double these speeds.

Drill Shanks.

One of the great wastes in drilling practice is in the breaking of the drill tangs. This breakage is caused usually by a lack of grinding and drill speed knowledge. Manufacturers of drills have placed on the market drills with straight shanks, double grooved shanks, sockets using pins, double tang sockets, etc. All these have been of value. By means of such schemes as the double tang sockets, drills have been reclaimed from the scrap heap.

Fig. 11 shows a method of driving a drill with a broken tang. The writer has drilled holes through socket and drill shank and inserted a pin. Fig. 12 shows a scheme for overcoming the breakage of tangs altogether.

All High Speed Steel Drills.

Fig. 13 shows a vanadium high power twisted drill. The steel used contains a very high percentage of tungsten with the adition of vanadium and chromium. The special feature is the "increased" twist. The illustration also shows the socket. At the mouth of the interior of the socket there is a circular steel boss or pin, which fits into the spiral grooves of the twisted shank and engages in direct contact with the drill. This pin relieve the tang from pressure of driving.

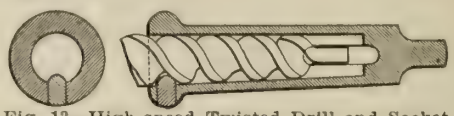


Fig. 13—High-speed Twisted Drill and Socket.

Fig. 14 shows a high speed steel drill made from flat bar stock. Pieces are riveted to the flat shank to give it the conical taper of the usual cut twist drill.

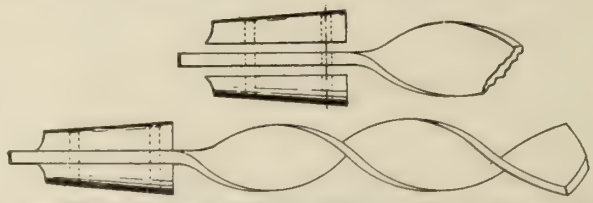


Fig. 14—"Flat" Twisted Drill is Made Ready for Taper Socket.

INSTRUCTION IN SHOPS.

Dr. Galbraith, dean of the School of Practical Science, Toronto, writing in his report refers to instruction in shops. He says that in addition to advancing means of transportation the University may soon be called upon to increase its facilities for coming into closer touch with trades and manufacturers. Industrial education is now a live topic. There seems to be no great reason why scientific and trade schools should not be established in their own works by the proprietors. A sufficient number of qualified teachers may be found among the officers and foremen to make a beginning. By proper co-operation between employers and their operatives such schools should be a success and justify their cost.

The University should provide for the education of the heads of the scientific departments in such works, and incidentally it may be of service in advising and encouraging the teachers in the works school. This method of initiating industrial schools would reduce to a minimum the danger of establishing them where they may not be needed. It will soon be necessary, he states, to help the shipbuilding industries by instituting a course in naval architecture.

In cold weather, steam generated in electric boilers will be used to maintain the temperature in the cars, and keep the various connections from freezing, when the trains of the Pennsylvania railway, entering New York station through the electrified tunnel zone, are disconnected from their steam locomotives. These electric boilers will utilize the 600 volt direct current from the third rail, and generate steam at 80 pounds pressure.

Machine Tool Manufacture---Quality and Guarantee

By Penstock

Being a Brief Review of Difficulties and Grievances That Arise Between Builders and Users of Machine Tools, Showing in Most Cases That the Lack of a Proper and Courtly Exchange of Opinion and Action Upon Opportune Advice May Lead to Unwarrantable Conclusions Being Drawn by Both Parties Concerning the Transaction of Sale and Purchase Between Them.

THE design, equipment, test and guarantee put up to-day by makers of machine tools may be generally reckoned as of a very high-grade, so much so we think as to be beyond question to the limit of human specialization, foresight and insight presently existing.

The purchaser, however, does not always see it in that light, and trouble between the manufacturer and user results. Inaccuracy of work produced by the machine is the fruitful cause, and an often unreasonable deduction on the user's part hastily arrived at, gives the maker credit for careless construction. A condition like this is naturally unsatisfactory and annoying to both parties, reflecting as it does on the manufacturer and his business, and injuring it may be, the quality and quantity of the user's output.

In the writer's experience probably the chief element affecting the reliability of a machine is that due to the user taking it to pieces for examination purposes, when it arrives from the builder. That he is perfectly within his right in doing so no one will gainsay, but that he shows wisdom in his action is open to serious doubt.

I have often wondered if curiosity to see the very vitals of his purchase is not in some real sense suggestive again of the eagerness of childhood to break the outer shell of its toy to investigate the source of the "squeak," and if the result in either case has not a parallel in that neither are qualified to replace properly the whole again.

The practice, mark you, is followed by expert users and may not always be chargeable to quest for opportunity of criticism ; but to a desire and the very laudable one of admiring the constructive design and workmanship.

From whatever motive the dismantling takes place, a grave error is committed. The user seldom has the equipment to re-assemble the machine as it should be and was, when it left the manufacturers' hands. The latter is the real architect of its structure, the former simply buys the use of it.

A man when he buys a home does not take it to pieces, and being satisfied try and put it together again with a view to living comfortably. He rather relies upon and accepts his own judgment in the purchase believing that he has got what he bargained for from a reputable seller.

Machine tool builders cannot afford to-day to be other than reputable, it is their particular and chosen business, they are equipped for it and are willing to guarantee their individual output. As a user then give them that trust you like reposed in yourself, by refraining from dismantling their product and piling cost and worry on yourself and them.

Most machine tool makers record the tests of their product, and furnish the purchaser with a copy showing the limit of error established.

As distinct from the source of trouble just discussed, other features of heart-burning are quite common. One of those is inaccuracy of levelling when the machine is installed and the want of verification after operation has been going on for a few months. This inaccurracy of level is due in large part to the want of proper appliances or to improper application of them.

Levelling should be done lengthways and across, before the machine is bolted to its foundation. Wood packing or wedges to which oil or water may have access and settlement of foundations are each conditions liable to affect originally correct setting and require careful keeping track of.

Some makers make a point of informing their user purchasers of what to do and what not to do, a course made necessary for their protection and emanating from past experience.

A lathe manufacturing concern we have in mind impresses on its customers the necessity of carefully trying out the tool and asks to be thereafter informed as to faults or otherwise. They especially lay stress on the unwise course of attempted rectification by the user, and urge their willingness to replace defective parts or provide expert adjustment where necessary. The manufacturer, as we take it, is prepared to furnish the machine complete and perfect for the work, leaving the operator to see to his own particular sphere.

Another feature that users do not sufficiently realize, although laid great stress upon by the manufacturer, is the question of sufficient lubrication. Machinery in motion of any description, depends for its continuous and efficient running with minimum tear and wear, on regular and systematic lubrication.

For machine tools best quality mineral oil is recommended, having in view the high speed and heavy cutting demanded in present day practice. Like quick revolution, forced and self lubricating engines, the wear on bearing surfaces of machine tools should be nil. The lubricant should be of quality and quantity to form a film between the surfaces, which film in its turn prevents contact of them, and by cutting out wear enables the machine to maintain a continuous accuracy of production.

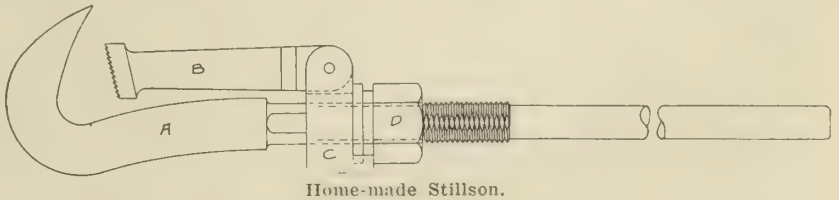
From what has been said it will be realized that much is to be gained by maker and user alike from a proper understanding of the question as it relates to each. The tendency we are glad to say is in all business relationships, to deliver to the hilt and to consummate a square deal.

Every known existing obstacle should therefore be thrown aside, not only as between machine tool builder and user, but with respect to every other business relationship of man and man.

HOME-MADE STILLSON.

The usual Stillson wrench, costly as it is, is often dispensed with in places where it would prove quite useful, other tools taking its place. Wm. Kennedy & Sons, Owen Sound, have a home-made article, which while costing but a fraction of the real article, meets all their shop requirements.

The body of the wrench, A, consists of a forging bent, as shown at the left with the right-hand end turned down to form a handle, the upper part of the handle being threaded, and the sides milled flat to the thickness of the handle. The gripping jaw, B, is a steel forging, with teeth, as shown, the whole being pivoted on the sliding part, C. The sliding part, C, is shaped to fit loosely over top of the threads, and the flattened sides, the latter preventing its turning. The lower face of C has a lip, which engages in an annular groove in the nut, D, which may be revolved to give the proper adjustment. All the parts being forged are very strong. Several different sizes are in use.



Home-made Stillson.

Boiler Design, Construction, Operation, Repairing and Inspection*

By H. S. Jeffery

The Various Points in Connection With Boiler Practice Will be Clearly Taken up in This Series. The First Article Deals With the Boiler Shell, Including Repairing, Factor of Safety, Hydrostatic Test and Number of Courses. The Series Will be a Complete Text Book on the Subject of Boilers, and They Should be Preserved for Reference.

Size and Number of Boilers.

(8) In deciding upon the length and diameter of a tubular boiler, the boiler designer is called upon to consider many matters. The steam pressure per square inch is one consideration, and the boiler horse-power desired another consideration. Decide these; then size and number of boilers.

The solution of whether one large boiler, or two or more smaller boilers should be installed, must be governed by the circumstance of each case.

The purchaser will be inclined as a rule towards the large boiler rather than two smaller boilers on account of the former in regards to first costs being cheaper than the latter.

The boiler room having only one boiler usually means Sunday work for the operating engineer; the passing over until a "more favorable time" repairs which should be made promptly and which if made at the right time would in many instances have saved the owner considerable, and in other cases would have prevented a boiler disaster.

With a battery of boilers it is not difficult to cut out of service one boiler for repairs without causing a shut-down of the plant or part thereof—in fact it is the practice with some when installing a battery of boilers to install one or two more boilers than necessary, the same being out of service, except when used in lieu of one of the regular boilers.

It is advisable and true economy as a general rule not to depend upon one boiler. There are instances where plants at their busiest season, employing considerable force, have had to shut down for several days in order to make repairs to the boiler.

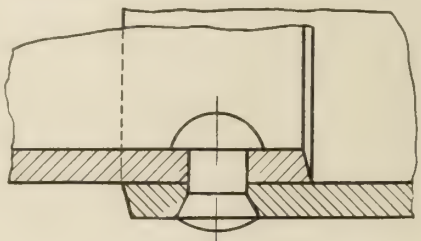


Fig. 9.

The length and the diameter of a boiler is sometimes a mere matter of choice. Other times the designer must consider the space allotted for the boiler. Perhaps it is the desire to install a 66 inch by 16 feet boiler, but the limited space will require the length to be limited to 14 feet. In this case it would necessitate increasing the diameter, or in lieu of the 66 inch by 16 feet boiler there would ordinarily be installed a 72 inch by 14 feet boiler.

Shell Thickness Increases with Diameter

(9) Increasing the diameter of a boiler means an increase in the force acting upon the longitudinal plane. For instance: The force acting on the longitudinal plane of a 66 inch by 16 ft. boiler will be with 100 pounds pressure per square inch as follows:

66 x 192 x 100=1,267,200 pounds.

With a 72 in. by 16 ft. boiler, same pressure per square inch as in the foregoing example, the total load on the longitudinal plane will be:

72 x 192 x 100=1,382,400 pounds.

Thus, 1,382,400—1,267,200=115,200 pounds difference.

In considering the diameter of the boiler and the thickness of the shell plate, it is necessary to consider the efficiency of the longitudinal seam. For instance: The allowable working pressure on a 66 inch by 16 ft. boiler, plate 60,000 tensile strength and 7-16 in. in thickness, factor of safety of 5, efficiency of longitudinal seam 70 per cent., will be:

$$\frac{60{,}000 \times .70 \times .875}{66 \times 5} = 114 \text{ pounds.}$$

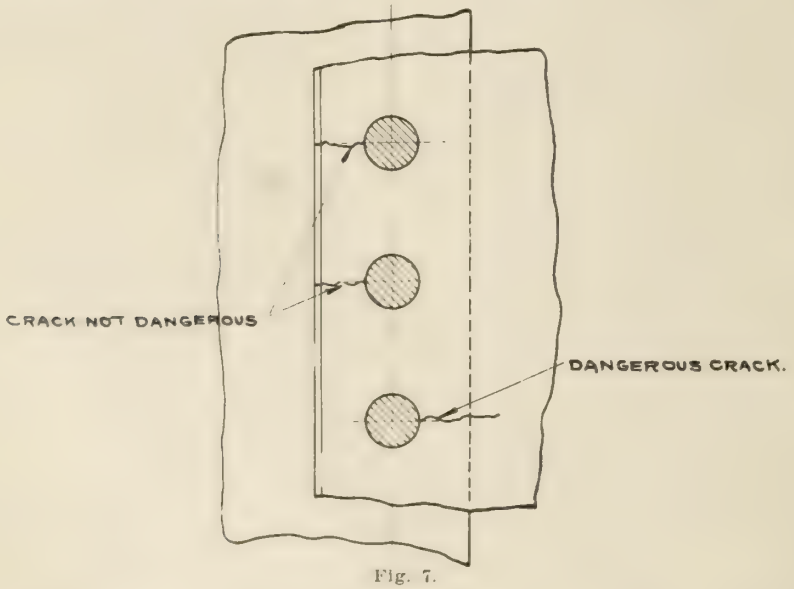


Fig. 7.

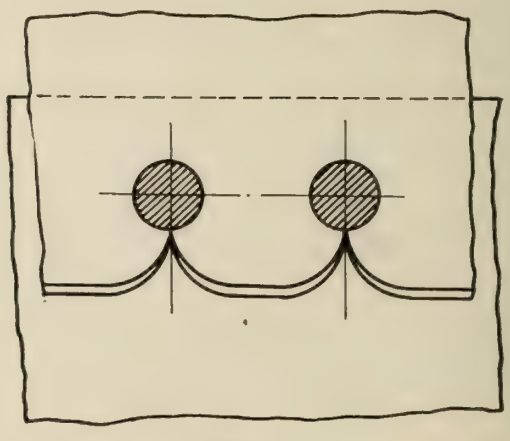


Fig. 8.

Now, a 72 in. by 16 ft. boiler, same as the above in regards to tensile strength, thickness of plate, factor of safety, but with a longitudinal seam having an efficiency of 80 per cent., will be allowed:

$$\frac{60{,}000 \times .80 \times .875}{72 \times 5} = 113 \text{ pounds}$$

Assuming the horse-power of a 66 in. by 16 ft. boiler to be the same as the horse-power of a 72 in. by 14 ft. boiler—

*Second of a series of articles on this subject.

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and many boiler manufacturers have them so rated—the 66 in. by 16 ft. boiler would be cheaper as to first costs and ordinarily would be a better steamer than the 72 in. by 14 ft. boiler; and being a better steamer would not consume as much fuel.

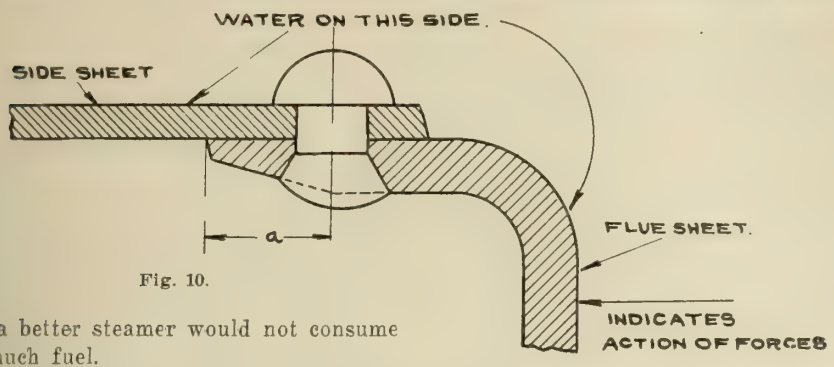
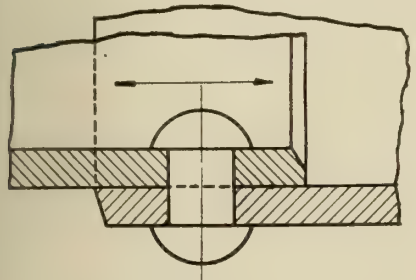


Fig. 10.

The chief reason why the 72 in. by 14 ft. boiler would cost as much and perhaps more than a 66 in. by 16 ft. boiler, is due to the fact that the former will ordinarily be constructed with a shell plate at least 1-16 inch heavier than the latter; also, the former boiler will require more tubes than the latter,


Fig. 11.

and a little more work in the way of drilling flue holes, rolling flues, etc. The total costs of the respective boilers will not, however, be a great differential.

The question has been asked more than once as to why Marine Boilers are constructed ten feet and more in diameter, while tubular boilers are rarely made greater in diameter than seven feet. The reason why Marine Boilers can be made large, having shell plates from one in. to one and one-half in. in thickness, is due to the fact that the shell plates are not in contact with the flames and hot gases.

The better part, one-half or more, of the shell of a tubular boiler is in contact with the flames and hot gases, and is a part of the heating surface of the boiler.

Fire-Cracks.

(10) The heavier the plate the more liable it is to become overheated. This is especially true if foreign substances are allowed to adhere to the plate. Frequently the plate of the girth seams of a tubular boiler crack from the rivet hole to the edge of the plate, as shown in Fig. 7, which is spoken of as fire-cracks.

This is due to the plate only being indirectly cooled by the water within the boiler; hence, it becomes semi-overheated, setting up stresses which crack the plate. The cracks are not serious—that is, dangerous, unless there are many such cracks. If, however, the crack extends into the solid plate, then take steps at once to prevent the crack from extending itself.

The girth seam of a tubular boiler directly over the bridge wall, as shown in Fig. 6, usually receives the impinging flame and due to the double thickness of metal, as well as the rivet heads, the metal at this point is many degrees hotter than at other points, resulting in fire-cracks.

Fire-cracks are frequently calked over and remain steam-tight. Sometimes they become troublesome and are taken care of by chipping out and calking, as shown in Fig. 8. Of late some manufacturers, who have adopted the two-course tubular boiler type of construction, are now driving the rivets in the lower part of the girth seam as shown in Fig. 9. This, however, they are limiting to just the girth seam over the bridge wall and about two feet up on each side of the boiler.

It is possible for the boiler designer with some types of boilers to design the boiler lines to prevent undue cracking of the plate from the rivet holes to the calking edge.

This can be done with the furnace of locomotive type boilers. The practice is to bevel the door sheet and the flue sheet, especially the latter, for it is the heavier of those composing the furnace, in the manner shown in Fig. 10.

The rivet holes are countersunk and the rivets driven with an oval countersunk head on the side in contact with the flames and hot gases. The beveling of the plate and the installation of the rivets with oval head is for the purpose of having as little metal as possible indirectly cooled by the water within the boiler.

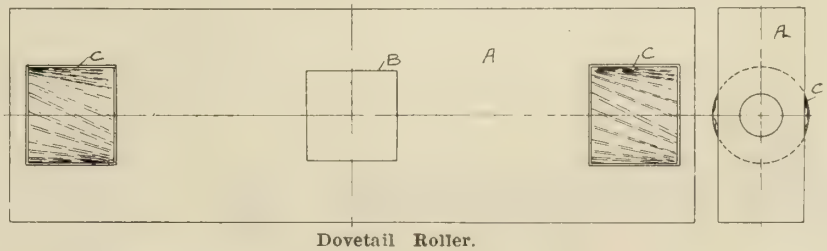
Such a practice is applicable with the furnace of the locomotive type boiler, for the force acting on the furnace acts as indicated by arrow, Fig. 10, and thus the plate from the centre of the rivet hole to the edge of the plate has no force acting upon it, while the plate from the centre of the rivet hole to the edge of the plate of the girth seam of a tubular, the same being indicated in Fig. 11, has to resist the force acting upon the transverse plane of the vessel.

The distance from the centre of the rivet hole to the edge of the plate with the girth seam of a tubular boiler should be one and one-half times the diameter of the rivet hole, while the distance a, Fig. 10, can be considerably less—usually about 1 1-8 times the diameter of the rivet hole—and, because of the action of the force as described.

DOVETAIL ROLLER.

In the old style gate valve made by the Canada Foundry Co., Toronto, the wedge or gate is made of cast iron with brass facing. This brass facing piece is dovetailed into the cast iron wedge, by a circular dovetailing groove. Because of its form, it is impossible to fit them together because of the bottom of the dovetail groove being greater in diameter than the top. For that reason, other means are used. The two contact faces of both wedge and facing are machined, so that the facing will drop into the recess in the wedge. By means of the rollers shown in the accompanying sketch, the brass of the facing, is forced outward into the dovetail groove, making a solid union between the two. The face is afterwards machined to give the bearing surface.

The manner of operating the rollers is as follows: The plate A of which the



Dovetail Roller.

rollers consist, is placed on a square piece in the tool post, and over which hole B fits. The tool post is centralized and pressure brought to bear on it shoving the two hardened steel rollers C against the brass. The rollers are corrugated, which, added to the pressure, forces the brass outward into the dovetail groove.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

AN accessory to progress and good drawing work is a reliable equipment of tools. This need not be too expensive unless the aim is ultimate daily use in a drawing office. The various items described are such as will be found at least sufficient for the course as already outlined.

Apparatus and Applications.

The first necessary requirement is a drawing board, and this should be as large as can be conveniently handled in



Fig. 2 Drawing Board.

an ordinary furnished room. Sizes 17 by 24 inches minimum to 23 by 32 inches maximum will in most cases be found suitable. Fig. 1 in our first article of the series showed an adjustable board and table combined, while Fig 2 shows a simple board for use on a table or bench

The drawing board should be located where you have the benefit of a good light and your relation to it such that the light strikes the work from the left hand top corner. To realize the full effect on your paper, the light should be shaded, and to obviate excessive stooping the board should be placed conveniently high and slightly sloped toward you care being taken that the slope is not so great as to cause your tools to roll or slide off.

The drawing paper should be bought in sheets of sizes 15 by 20 inches and 22 by 30 inches respectively to suit the drawing boards already referred to and ensure no overlap beyond the board edges. Paper used of the full size of

drawing board may run just over the edge on which the head of the tee square slides and does not therefore give a truly square line to that edge. When overhanging the other edges it invariably gets ragged and inclines to tear in on the work.

Drawing sheets are not usually perfectly square edge to edge, therefore when fixing to your drawing board see that the edge next the tee square head or left hand is parallel with that edge of the board.



Fig. 5 –Bale Head Drawing Tacks.

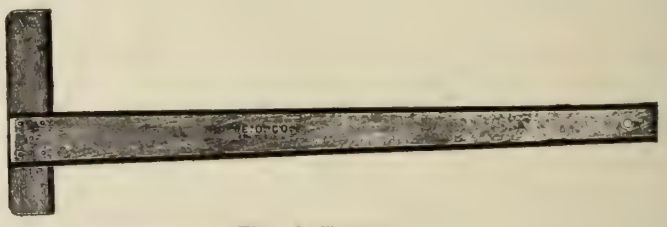


Fig. 6—T-square.

For practice purposes good paper is indispensable and Whatman's hot pressed demy and imperial are recommended.

Regular drawing office work admits of very inferior quality of paper being used, the reasons being that the draftsman is usually expert enough to treat it tenderly while making use of it and that immediately the tracing copy is made the drawing sheet finds a resting place in the waste paper basket. You, if a beginner, would experience much disgust with your efforts and their effect on poor quality paper and as it is an intention to minimize your self-abasement as far as possible, good quality paper in your hands becomes a necessity.

Figs. 3-4-5 illustrate various styles and sizes of drawing tacks, those with the bevelled edges, Fig. 3, being perhaps the most suitable at a diameter of ½-inch. One tack should be placed at each corner about ½-inch in from the edges of the paper and a further tack placed at the lower edge about the middle of the paper length, also ½-inch in from the edge of the paper. Tacks should never be placed on the left or right hand edges intermediate to those at the corners as they interfere with the movement of the tee square and tend to chew its edge. The drawing paper should be drawn flat and tight when being tacked to the board.

The tee square, Fig. 6, should be at least the length of the drawing board between the inside of head and point and should not exceed that distance, if possible for convenience. A tapered blade as shown gives usually a better balanced tool and excess length upper part head over the lower should be a feature. This admits of the tee square being operated close down to the lower edge of the sheet without danger of the horizontal lines being out of square with the left hand edge of the board through insufficient bearing surface of head. The drawing edge must never be used for cutting paper.

The tee square should be hung up by the hole in blade when not in use and in the case of it falling to the floor accidentally at any time, a line previously drawn by it on the board and used as a setting standard should be taken to re-

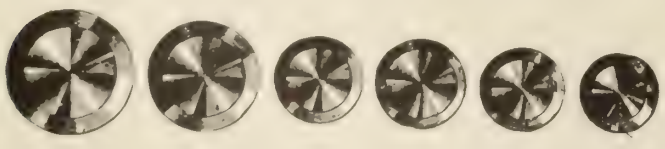


Fig. 3 Bevel Head Drawing Tacks.

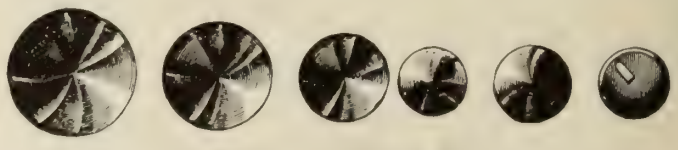


Fig. 4—Stamped Drawing Tacks.

set the blade if it has shifted.

The purpose of the tee square is the drawing of right angled horizontal lines, and the forming of a base on which the triangles or set squares rest when vertical or angular lines are required.

*Second of a series of an Instruction Course. A lesson will be given each month.

NEW UNITED STATES STEEL PENSION PLAN.

Plans have been consummated to pay pensions from the United States Steel and Carnegie Pension Fund, which was established last spring by the joint action of the United States Steel Corporation and Andrew Carnegie. This fund was established for the purpose of paying old age pensions from the income of the fund to employes of the United States Steel Corporation and its subsidiary companies. For this purpose the United States Steel Corporation provided eight million dollars, which, with the Carnegie Relief Fund of four million dollars, created by Andrew Carnegie on March 12, 1901, makes up a joint fund of twelve million dollars. This pension fund is administered by a board of twelve trustees, through a manager appointed by the board, with such powers and duties as may be given him by the board.

The Board of Trustees has adopted pension rules for the administration of this fund, to take effect on January 1, 1911, and apply to persons who are in the service of the United States Steel Corporation and its subsidiary companies on and after that date.

Under the pension rules three classes of pensions are provided :

First—Pensions by compulsory retirement, granted to employes who have been twenty years or longer in the service and have reached the age of seventy years for men and sixty years for women.

Second—Pensions by retirement at request, granted to employes who have been twenty years or longer in the service and have reached the age of sixty years for men and fifty years for women.

Third—Pensions for permanent incapacity, granted to employes who have been twenty years or longer in the service and have become permanently totally incapacitated through no fault of their own.

The monthly pensions to be paid from the income of the fund will be made up on the following basis. For each year of service 1 per cent. of the average regular monthly pay received during the last ten years of service ; provided, however, that no pension shall be more than $100 a month or less than $12 a month. For example, an employe who has been 25 years in the service and has received an average regular monthly pay of $60 a month will receive a pension allowance of $15 a month.

This pension fund provides for the support of faithful employes in their old age It is entirely separate and distinct from the voluntary accident relief plan put into operation by the United States Steel Corporation on May 1, 1910, which provides for employes who may be injured and the families of employes who may be killed while at work in the service of the subsidiary companies of the United States Steel Corporation.

Neither the voluntary accident relief plan nor the United States Steel and Carnegie pension fund involves any contribution from the men themselves toward the accident relief or old age pensions.

Societies and Personal

J. G. Sullivan has been appointed assistant engineer on the C. P. R. with headquarters at Winnipeg.

* * *

J. G. Taylor, heretofore superintendent district 1, Alberta division, C.P.R., Medicine Hat, has been appointed general superintendent Lake Superior division. His headquarters are North Bay.

* * *

H. McDonald, fitter in the C.P.R. Lethbridge shops, Alta., has been appointed shop foreman there.

* * *

M. A. Cardell, heretofore C.P.R. shop foreman at Lethbridge, Alta., has been appointed shop foreman at Medicine Hat, Alta., vice J. McQuarrie, appointed locomotive foreman at Sutherland, Sask.

* * *

Peterboro Lodge, 286 of Machinists, held an anniversary night on Jan. 26, when a social time was spent.

* * *

The Canadian Railway Club, Montreal, meets at the Windsor Hotel, on March 7, when a paper will be presented by L. R. Clausen, Divisional Supt. of the C. M. & St. P. Ry., Chicago, Ill., on the subject of "Railway Signalling."

* * *

Thos. Arnold, vice-pres. Taylor & Arnold, Montreal ; D. A. Evans, draftsman, G. T. P. shops, Winnipeg ; and Clifford Walker, Taylor & Arnold, Winnipeg, have been elected members of the Western Canada Railway Club, Winnipeg.

* * *

The McLaughlin Carriage and Motor Car Companies, Oshawa, held an Employes' Ball on Jan. 24, in one of the wings of the new automobile works. The ball was a success from every point of view, due to the efficient management of this committee : H. Cook, B. McCabe, W. Haynes, N. Hall, A. Moffatt, A. Brownley, M. Parker, G. Johnston, J. H. Beaton, A. McClure, J. B. McCullough, Mr. Waters, W. A. Coad, G. C. McKeen, E. Hamilton, Ed. Michael, H. Hagerman and Jack Crawford. The 500 guests were addressed by Robt. McLaughlin early in the evening.

* * *

St. Thomas machinists held the first annual ball in the Engineers' Building, St. Thomas, on Feb. 16. The master of ceremonies was John Fitzpatrick. The committee was composed of John Lane, chairman; W. E. Moore, secretary-treasurer; J. W. S. Booth, J. H. Gray, T. Stone, Frank Clark, John I. Stewart, W. Follick, Wm. Bortman and P. G. Erickson.

* * *

The Alberta Wholesale Implement and Carriage Dealers' Association held its annual meeting Feb. 4, in Calgary. The officers for 1911 are:—President, J. A. Latimer, Cockshutt Plow Co.; first vice-pres., S. H. Roe, Tudhope, Anderson & Co. ; second vice-pres., L. P. Winslow ; Ontario Wind Engine and Pump Co.; treas., A. W. Trickey, Massey-Harris Co.; sec'y, W. E. Hall, Cockshutt Plow Co. ; Executive Committee, J. A. Brookbank, International Harvester Co.; A. W. Trickey; F. T. Wright, Canadian Moline Plow Co.; J. Ruttle, McLaughlin Carriage Co.; O. S. Chapin, Chapin Co.; P. D. McLaren, Canadian Fairbanks.

* * *

Librarian Carson of the London Public Library, has been giving lectures at the G. T. R. shops, McClary's, and other shops and foundries in London, drawing the attention of mechanics to books in the library of interest to them.

* * *

The first of a series of social affairs to bring the C.N.R. and C.P.R. machinists together was held Feb. 17 in the Odd Fellows' temple. The evening started with a reception at 8 o'clock and a concert at 8.30, which included many interesting numbers together with a short talk by A. W. Puttee who acted as chairman of the concert programme. Following the entertainment programme there was a luncheon which in turn was followed by dancing. A joint committee was in charge consisting of the following:—E. Pearson, chairman; W. J. Paterson, secretary, and A. Gamble, M.C.; G. Douglas, D. McCullough, G. Johnston, H. McDonald, S. Miller, M. H. MacGregor, A. Pentland, J. Mountjoy, F. Pratt, A. Kain, R. F. Ward, J. G. MacFadden, G. Smith, and A. R. McEwen.

* * *

Lumen P. Sherwood, Peterboro, in a competitive examination, won the position of chief assistant of the Department of Railways and Canals, Ottawa.

* * *

J. F. I. Thomas, M.I. Mech. E., A.M. Inst. C.E., representing the electrical department of Vickers Sons and Maxim, Sheffield, England, spent a few days in Toronto recently on his way from England to Winnipeg. He goes to the prairie city to supervise the installation of the electrical equipment being supplied by his firm for the municipal hydro-electric works, Point du Bois Falls, Winnipeg River, Winnipeg, Manitoba.

J. M. Burke district master mechanic C.P.R. district No. 1 Atlantic division with headquarters at Brownville Jct., Me., has been appointed master mechanic eastern division with headquarters at Smith's Falls, Ont.

* * *

Paul J. Myler, vice-president Canadian Westinghouse Co., Hamilton, has been elected president of the Ontario Motor League.

* * *

W. E. Barnes, roundhouse and locomotive inspector, Moncton, N.B., has been appointed master mechanic eastern division, I.C.R., with headquarters at Moncton.

* * *

T. Ross has been appointed master mechanic of the T. & N. O. Ry., with headquarters at North Bay.

* * *

George H. Wadsworth, for the past 15 years superintendent of the Falls Rivet & Machine Co., Cuyahoga Falls, Ohio, has resigned that position, and will on and after March 1 devote his entire time to the Wadsworth Core Machine & Equipment Co., Akron, Ohio. He has purchased all machinery, patterns, tools and interest from the Falls Clutch & Machinery Co., successor to the Falls Rivet & Machine Co. for the manufacture of the Wadsworth core machine and equipment as manufactured by that company during the last seven years for him.

* * *

Wm. C. Mitchell, formerly superintendent of the Dominion Steel Co., has opened an office in the Canadian Express Building, Montreal, as a consulting engineer. Mr. Mitchell is prepared to undertake the design of modern iron and steel plants, and the securing of economies in existing plants.

* * *

J. T. Brower, of the Structural Steel Co., Longue Point, Que., has been appointed general manager of the National Bridge Co., Montreal.

* * *

Frank Walker, formerly of the C. P.R. at Smith's Falls, has been appointed foreman of general repairs for the New Glasgow plant of the Nova Scotia Steel & Coal Co.

* * *

S. S. Underwood, chief draughtsman G.T.R. Car Department, Montreal, was presented recently, with a fitted traveling bag, and a brooch for his wife, by the staff, on his leaving the service, to enter that of Taylor & Arnold, dealers in railway equipment and supplies, Montreal and Winnipeg.

* * *

The Master Car Builders' Association meets in Atlantic City, June 19-21; the Railway Supply Mfrs. Association, June 14-21, and the American Railway Master Mechanics' Association June 14-16.

* * *

A. W. Horsey, formerly master mechanic eastern division C.P.R., with headquarters at Smith's Falls, Ont., has been appointed district master mechanic district No. 1 vice D. L. Jones transferred to the Atlantic division. His headquarters will be at Farnham, P.Q.

* * *

H. Smith, formerly superintendent of the Canadian Crocker Wheeler Co., St. Catharines, has accepted a position with the Canada Foundry, Toronto.

* * *

Edward Blake, jr., manager of sales for the Wells Brothers Co., Greenfield, Mass., for the past four years, and a director of the corporation, severed his connection with the company Feb 1. He has obtained the controlling interest in the Canadian Tap & Die Co., Galt, Ont., of which he has been trasurer since its organization in 1905. He has taken the active management of the company's affairs and will devote his entire time to promoting its business. Mr. Blake came from the west nine years ago to enter the employ of the Wells Brothers Co. as a stock clerk and acquired a thorough knowledge of the entire line of Little Giant screw thread cutting tools and machinery, which was of great value in his later work. He was promoted to the order department, and from there went through the various departments of the offices to the desk of sales manager and manager of the offices. His work in this capacity was eminently successful and in 1909 he was elected a director.

* * *

The Late Robert McDougall, Galt.

Robert McDougall, the founder of the R. McDougall Co., Galt, died on Feb. 17, at the age of 86. He was born in Roxboroughshire, Scotland, and was a resident of Galt for 60 years. In the early seventies he and his brother Thomas, commenced to manufacture iron pumps and windmills. Now the lines manufactured include metal and wood working machinery, pumps, etc., a specialty being metal working lathes.

* * *

P. J. Smith Banqueted.

Hotel Quinte, Belleville's famous hostelry, was the scene of a splendid banquet recently, when the business men of the town, assembled to bid farewell to P. J. Smith, who is removing to Winnipeg.

For the past four years and a half, Mr. Smith has been superintendent of the Canada Bolt and Nut Co.'s Rolling Mills at Belleville, which he has brought to a high state of efficiency. He was recently appointed manager of the Manitoba Rolling Mills, at Winnipeg, and his leaving to assume that position, was made the occasion of this unique banquet.

W. B. Deacon, president of the Board of Trade, acted as chairman, and splendid speeches were made by many of Belleville's most prominent citizens.



P. J. SMITH.

In response to the toast "Our Guest," Mr. Smith, foretold prosperity and business expansion for Belleville. He urged the business men of the city to work for better transportation facilities both by rail and water. This, he thought, would result in making Belleville an industrial centre.

That the banquet was such a huge success, was due largely to the efforts of Ald. R. C. Chown, who responded to the toast of the "City of Belleville."

* * *

CANADIAN BRANCH BRITISH MANUFACTURERS.

The associated firms of W. T. Glover & Co., Royce, The Howard Asphalt and Troughing Co., The Ashover Fluor Spar Mining Co., all of Manchester, England, have secured offices in the Lumsden Building, Toronto, for the purpose of direct representation on and supply to the Canadian market of the various specialities produced and manufactured by them. These latter consist of underground cables and wires, electric cranes, and direct current motors and dynamos, asphalt troughing for underground conduits and fluor spar for steel smelting.

C. S. Mallett who will be in charge and manage the Canadian business is renewing his connection with the Dominion after an absence of 12 years, all of which time he spent at the various firms' headquarters he now represents.

The scope of the business to be undertaken will include reporting and advising as to the best and most suitable equipment required, the supply, delivery and erection supervision of same and the furnishing of prompt and complete tenders, plans and specifications.

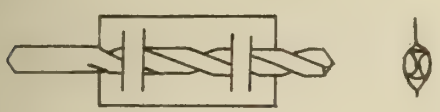
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

DRILLING KINK.

By G. B. Marquette.

In drilling a large number of holes close together, the chips and cuttings from the holes being drilled completely cover up the marks (lines and centre punch marks) of the next holes to be drilled, necessitating the operator to stop and blow or clear the cuttings away, before he can locate the next hole. If we take a piece of tin and cut



Removing Drill Chips.

two slits as per sketch and then pry the slit up as seen in end view, we can pass the drill through the two slits and it will be found tight enough to revolve with the drill. When the drill has completed the hole, we lower the drill until tin touches the work when the heavy cuttings will be brushed off while the finer dust will be fanned off by the rapidly revolving piece of tin, leaving the work clear, and the next hole centre easily located.

SUPPORTING COUNTERSHAFT.

By H. Smith.

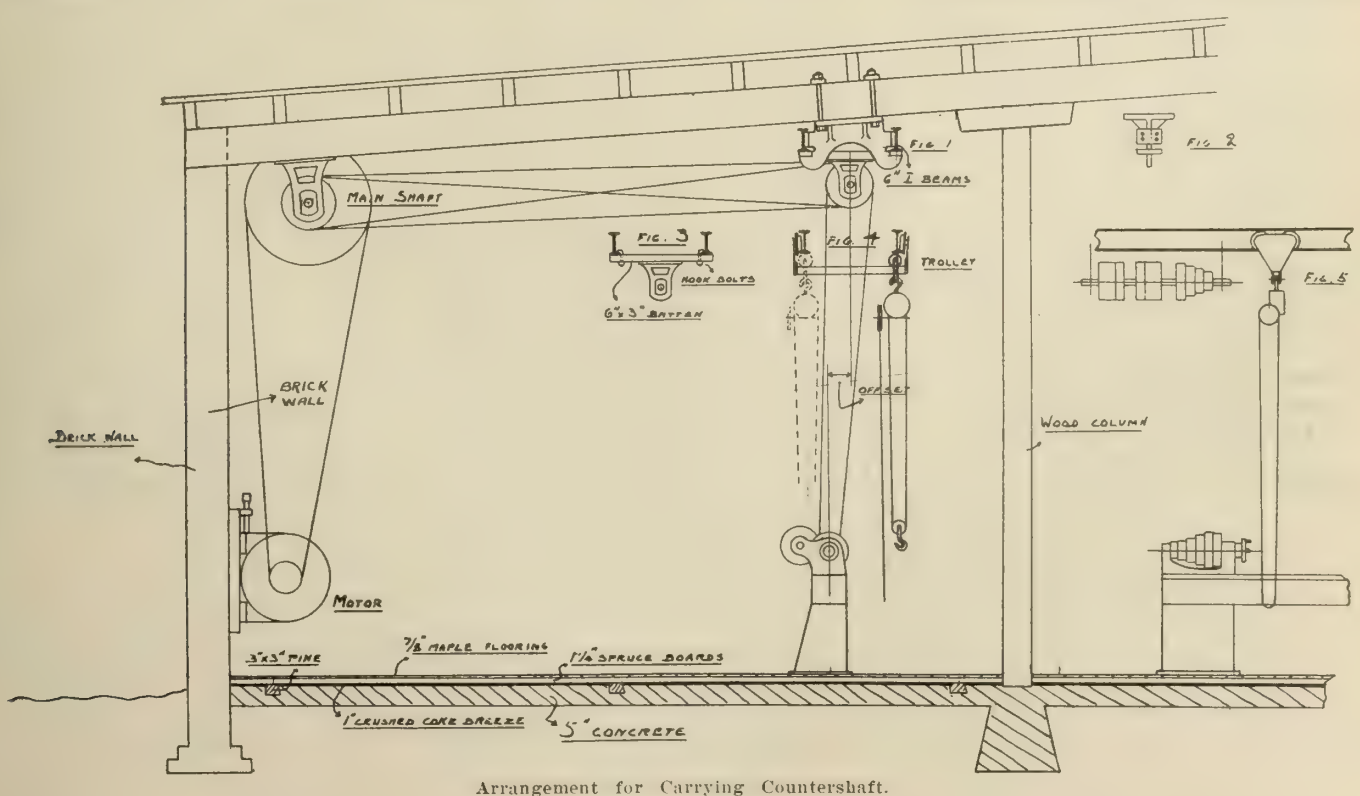
This sketch shows a convenient method of supporting countershaft gear from roof and has the advantage that it can be used in conjunction with a trolley and chain block for lifting work in and out of the machines. Steel I beams are carried over the line of machines by means of cast-iron brackets which are bolted to the roof beams. See Figs. 1 and 2. These beams for ordinary machine shops should be 26 in. to 30 in. apart and their depth will depend on the span between the roof beams, 6 in. for a 14 ft and 8 in. for a 16 ft. span being adequate. They must run the full length of the line of machines to be driven. Their centre line is offset from that of the machines so that the trolley has its range in front of the latter, enabling, say a lathe operator to pick up a heavy job from the floor and slide it into the centres without having to obtain the help of a couple of men to guide it in for him.

The countershaft hangers are bolted to wood battens which are readily placed in position on the steel beams by hook bolts. See Fig. 3.

The main driving pulleys on the countershafts are placed in the case of a lathe to the left of the headstock so that the trolley has a range of action the full length of bed in one direction and the distance between beam centres in the other. See Figs. 4 and 5. The whole arrangement has a neat appearance and saves time both in setting up machines and later in handling work too heavy to lift by hand.

Shop Floor.

The sketch also shows a first-class floor for a shop where moderately heavy work is handled, say up to 2 tons. The earth is levelled off and well tramped down before laying the 5 in. of concrete; 3 in. by 3 in. battens are laid in this, the length of shop and about 8 feet apart. These battens are bevelled as shown so that they have no tendency to pull out of the concrete and stand up 1 in. from the face of the latter. Crushed breeze is then rolled onto the surface of concrete when set and levelled off by means of straight edge from batten to batten; 1 1-4 in. spruce boards unplaned, but sawn equal in thickness, are then nailed to battens in a cross direction. Finally hard maple flooring, tongue and grooved, is laid, leaving a good level surface provided the underneath work has been properly carried out. This flooring will



Arrangement for Carrying Countershaft.

not splinter and has a certain amount of spring in it, due to the spruce underboards and coke breeze. The latter also allows for a certain amount of ventilation which is further amplified by the maple flooring boards being grooved underneath. There is no danger of dry rot setting in and castings dropped onto it are not so liable to break as on a bare concrete floor. It is easy on the operator's feet.

DISTANCE GAUGES.

By G. B Marquette.

An addition to the tool store are the "distance gauges" as per sketches. A great variety can be made, a combination of which will give any required di-

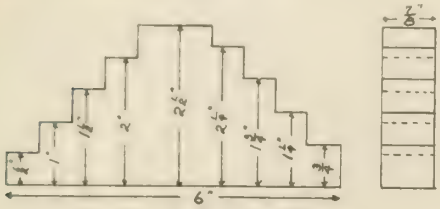
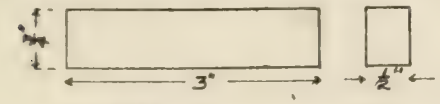


Fig. 1—A Distance Gauge.

mension. They can be made very cheaply (an apprentice could handle the job in the tool room) and the first cost is quickly returned by the rapidity with which a tool can be set to the required depth. The operator KNOWS without stopping to check the cut, that he has the given dimensions, and that it is RIGHT.

The apprentice could get them within grinding limits and stamp them, then harden and grind.

Fig. 1 shows a distance gauge and Fig. 2 the application of one. Referring to Fig. 2, the gauge is hardened and



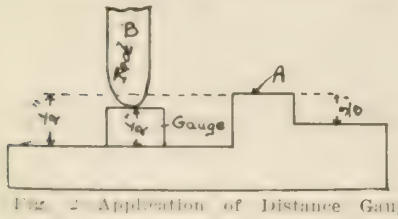


Fig. 2—Application of Distance Gauge.

ground. B is the tool and a chip must be taken from A to bring it down to the thickness shown by the gauge.

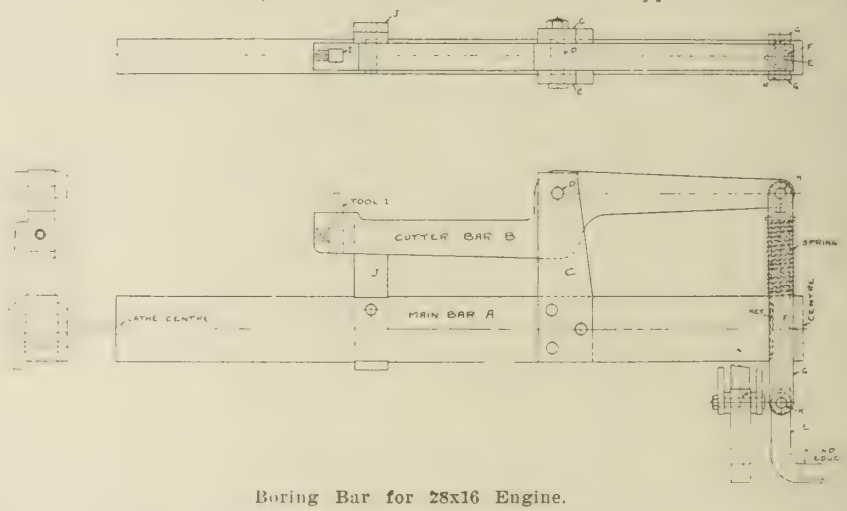
BORING BAR FOR ELLIPTIC CYLINDER.

The accompanying sketch shows a boring bar used in the works of the John Inglis Co., Toronto, for boring elliptic cylinders, and which can be used for boring cylinders of any shape.

The firm, in producing some cylinders for a special job—cylinders which were neither oval nor of the form of separated circular segments, in shape, were confronted with the proposition of machining. A tool something along the lines shown was made, but discarded in favor of this latter bar, devised by G. E. Fax, draftsman for the company.

The construction is as follows: A main bar A, swinging between lathe centres, the right on the tail-stock centre and the left on the head-stock, has a cutter bar B, attached to it by a double arm C, projecting from bar A, and this bar B is pivoted on C, by fulcrum pin D.

At the right-hand end, a square bar E, bent at its lower end, and turned on its upper portion, passes through a reamed hole F in bar A. This hole F has a key-way with corresponding key in E to prevent twisting of the part. Straps G straddling A, connect rod E through pin K to bar B through pin H. The lower end of rod E, which, as before mentioned, is bent, shaped approximately knife-edged, to follow a contour. On the tail spindle a form exactly the same in shape as the bore of the cylinder, is secured, and the edge at the lower end of E follows this, and causes



Boring Bar for 28x16 Engine.

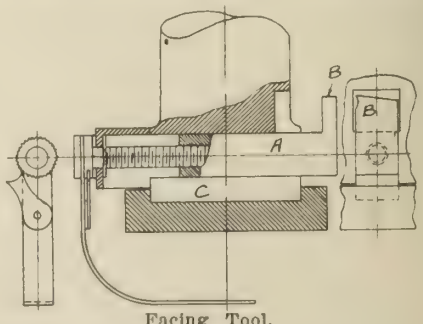
the tool I to follow the same motion, boring the cylinder the same shape as the guide. The spring on E causes the edge to follow the guide closely. The bore is the same as the guide, not only in shape, but in size, as the distance from D to H is the same as from D to I. Projecting piece J takes the strain of the cut, causing H.D. and the tip of I to be in a line parallel to the bar A and makes the motion very nearly perfectly true, the only error being that due to the slight angularity of the pin H at its extreme positions. The former bar made did not reproduce the desired shape so accurately, as the construction was somewhat different. Suppose the tool I to remain where it is, and the bar B to be across the main bar A, so that the tips of B at H would be at K. This cutter bar B would thus be diagonally across main bar A, and as the follower edge would move vertically, and the tool I in a circle, the motion would be distorted. This was practically overcome by having an off-set tool at I, turned to the left, so that the more the motion was distorted due to angularity, it would be compensated for by the tool digging in further.

FACING TOOL.

The accompanying sketch is of a handy facing tool made use of by Wm. Kennedy & Sons, Owen Sound, for facing of bolt holes in propeller hubs, flanges, and similar positions. The usual methods of using a flat cutter is familiar to all. Its principal objection lies in the fact that its whole cutting face strikes the hard scale first, removing the cutting edge before any material progress is made.

The facing tool here shown, operates on the principle of a cross cut bar, with a plain gooseneck tool, shown at A. The end B is bent up to form the gooseneck B, which forms the cutting edge. This tool is contained in a slot in the end of the usual type of bolt hole fac-

ing bar, and slides crosswise on strip C the whole being held in position by four cap screws in cap D. The tool A is tapped as shown, and a ratchet screw



Facing Tool.

feeds the tool across, giving the necessary cut. The beauty of the tool lies in its ability to keep below the hard skin, and thus save the tool.

This principle has been used by the company for the last 20 years giving great satisfaction.

Correspondence

Comments on articles appearing in Canadian Machinery will be cheerfully welcomed and letters containing useful ideas will be paid for.

Information regarding manufacturers of various lines, with their addresses will be supplied either through these columns or by letter, on request. Address letters to Canadian Machinery, 143-149 University Ave., Toronto.—Editor.

* * *

Tapping Hole Straight.

The correct answer to the question on tapping a hole through a sphere is as follows: Secure a faced nut over the tap and down against the work. If it touches all around, it indicates that the tap is going in straight.—Apprentice.

* * *

Tinning Cast Iron Cross-Head Slippers.

Will some of the readers of Canadian Machinery give me a method for tinning cross-head slippers in quantities so they can be planed.—W. A. T.

LONG LATHE WORK.

That word "long" in the title is used relatively—long in proportion to the lathe. A clever method of doing such work is by "splicing" two lathes to take in long bars as described in December issue of Canadian Machinery, p. 47. Most of us have seen or have worked on lathes having the range extended by means of a planed casting lined up with the original bed and "tie-rodded" to it, and know how seldom such a job is well done or remains accurate for any length of time. For my part, if possible, I prefer to take my chances in one lathe, if the work isn't longer than double the capacity of the lathe, and as an example will relate one job we used to do this way, which had to be finished accurately.

In Fig. 1 is shown a roller having journals at the ends and driven from one end, B, which occasionally twisted off at A under an extra heavy strain. These rollers, new, were 2 1-16 in. diameter, and, as they wore, were turned down to 1 15-16 in., the limit of adjustment in the machine in which they were used. They were brought to us to be dressed up, and we usually had to reduce them 1-32 in. in diameter to clean up the low spots. Our longest lathe was shorter than the rollers by about 2 feet, which meant that we had to reverse them to turn the body proper, and had to resort to some expedient when the journals had to be renewed; sometimes we had a combination of both jobs to do at one time.

Considering first the broken journal, we commenced by setting the jaws of the steady rest to an arbor between the centres of the diameter of the body of the roller. After that the tail stock was taken off the lathe and the rest moved to the extreme end of the ways. The other, or broken, end of the roller was clamped in a V-block on the cross slide of the carriage and lined up with calipers approximately true with the ways, and the same as the end in the steady rest which was already centred. Then with a drill in the universal chuck the end was drilled out and into the hole was driven one end of a bar of steel and pinned. To turn a new journal, on this inserted bar, its free end was gripped in the chuck, and the roller turned up to within 1-1000 in. at the part nearest to the journal to be. It will be noticed that the bar was left long enough to be turned, threaded, and cut off outside of the chuck.

This is, I think, about the most satisfactory way of turning and threading on the end of work longer than the machine; at one time I had a lot of 12 in. pipe to cut off and thread, and did it by cutting the pieces about 4 in. longer than the made-up length, threading to a caliper fit, and cutting off with the cut-off tool.

To return to the roll turning job, it can be imagined that when cleaning up the body—with a cut never exceeding 1-64 in. deep—trouble would be experienced from chattering. We proceeded as follows: one end was chucked on the journal and the best portion of the roll proper turned up with an indicator. The steady rest (set first to an arbor) was used to support the other end of the roller, and was set on the best spot, near the end of the lathe, which usually left from 2 to 3 feet projecting.

As to the cut, we started in close up to the steady rest with a fine round-nosed tool having plenty of rake and running with a fine feed. After the cut had moved up toward the headstock 12 in. to 15 in., it would show signs of chattering when we would apply a second steady rest as near the end of the new cut as the carriage would permit, and proceed as before, moving this "following steady rest" every foot or so. After turning the major part of the roll, which was on the lathe, it was reversed, set in the steady rest, and centered by the chuck till the newly turned portion was true.

We found the second steady rest superior to a follow rest for the reason that the work was held in all directions, while with the follow rest the sag toward the center of the unsupported portion of the roll was considerable, and the cut was not heavy enough to keep it up against the jaws.

It was necessary to turn the rollers to within 1-1000 in., for which a micrometer was invaluable. We finished with a fine file and polished with No. 00 emery cloth. This gave us a surface equal to the ground finish on the rolls when they were new, and fully as accurate. Sometimes the rolls would show an almost fiendish tendency to chatter, and we fell back on a flat-nosed tool with top rake only, setting it so it cut on the side next the headstock only, and clear a 1-32 in. on the other side of the front edge.

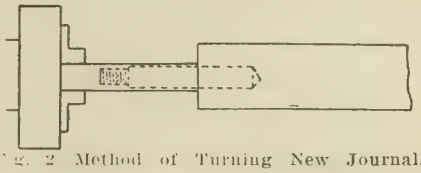


Fig. 2 Method of Turning New Journal.

Those who have accurate turning of this nature will find the above method a little slow, perhaps, but sure. I prefer it to a built-on lathe, if the work is short enough, but must admit its inferiority to the "double" lathe mentioned at the beginning of this article, or one good long lathe.—D. A. Hampson.

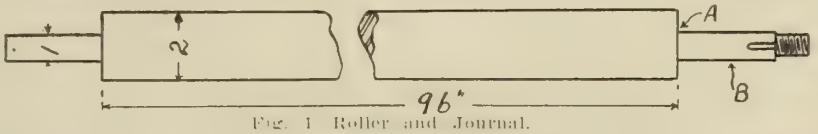


Fig. 1 Roller and Journal.

A centrifugal oil separator paid for itself in sixty days in a watch factory. It is used to clean superfluous oil from the work and to separate oil from waste. The oil is used over again.

The superintendent of an insulated wire factory, which employes a great number of women operatives, has established a noon lunch room where a meal, including soup, meat and a dessert, may be purchased for thirteen cents. The restaurant is in charge of a local caterer and the figure given covers the cost of the meals.

The Iron Trade Review recently called attention to the fact that motors installed in machine shops are frequently too large, owing to the fact that the exact amount of power required is not definitely known. As a motor is most efficient at full load, the result is that there is an undue loss of efficiency. A number of cases are cited wherein the exact amount of power required was determined by means of volt meter and ammeter readings, showing that the motor in use was of too high a power, and after this motor was replaced with one of the required power, a considerable economy of power was effected.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

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Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. VII. March, 1911 No. 3

"DIGGING."

Efficiency campaigns have been carried on and much written on the subject. It is known as "good management" or "scientific management" but it really amounts to the same thing—"digging," that is, working for the best work in the quickest time, at the lowest cost, with good wages to the producers of these results.

The United States Interstate Commerce Commission has brought to light systems of management by which the output of the plant has been increased, not by increasing the equipment or the number of workmen but by investigating existent conditions and making changes which result in greater economies and enable the company to increase the dividends and pay better wages to their employes.

There can be no objection to the statement: "To get the best results from men, offer inducements commensurate with the cost to them of maximum effort." The healthy human has no objections to work if it is made pleasant for him and he is paid at least market value for his efforts.

It is gratifying to note that the reduction in costs of manufacturing has been done without reducing wages. In fact, experienced organizers provide for largely increased wages to efficient workmen who put forth their best efforts. This is done by means of a piece-work or premium system which stimulates effort and rewards the efficient workmen.

There are other means by which costs have been reduced and are reduced. It calls for investigation—or digging—to bring them to light, but it pays. In the Feb. issue appeared an article on Scientific Management—what it is and what it will do. It pays to get away from the "rule o' thumb" method of doing things whether in the drafting room, manager's office, foremen's office or in the workshop.

The buying department also calls for some "digging." It is well to use a magnifying glass or a microscope occasionally and search for the little leaks. Recently we learned of one company that is losing thousands of dollars in buying alone. A "rank outsider" discovered it.

One firm was building its own special machinery. A little "digging" revealed that a company specially equipped for such work would have built the same machines for 25 per cent. less.

Another firm was throwing away the small ends of high speed steel cutters and drills, but it was discovered by a foreman that these could be used to advantage by using the pieces as tips for tools. The method was practically that given in "Efficiency of Tools and Economy in their manufacture" in the February issue.

A number of pertinent questions are asked in the article on "What is Scientific Management," that are worth studying. They should lead to "digging" for leaks in your plant. A vigorous search will reveal unthought of leaks. One small Toronto factory saved $11,400 in a year by scientific management. Reports are continuously being brought to light of leaks stopped and the shop being brought to a higher state of efficiency, all accomplished by "digging."

MACHINE TOOL COMPLAINTS.

The article in our present issue entitled "Machine Tool Manufacture—Quality and Guarantee" is worthy the attention of and careful reading by all users of these commodities. The purchase of a machine tool or in fact anything from a reputable maker should be recognized as something beyond a mere monetary transaction. It should be, and really is, the assistance which one man gives another in the highest and best sense, enabling each to do more perfectly in combination, that which neither could perform as well individually.

The guarantees and advices given users by manufacturers have a real cash value to both, and the sentiments expressed in "Penstock's" paper merit the practical emulation of all producers and appreciative regard of all operators. Machine tool manufacture and operation have reached a high pitch of excellence, to maintain and surpass which must needs demand the helpful co-operation of both parties interested.

THE QUEBEC BRIDGE.

For the second time since the Quebec Bridge Commission has had the plans of a new bridge under consideration, experts have been called in to settle a difference which has arisen between the members of the board on engineering points. The immediate trouble, says a Montreal paper, is that engineers Modjeska and Macdonald favor the St. Lawrence Bridge Co. tender on its own plans, while engineer Vautelet favors the Empire Bridge Co. tender on the board's plans.

In the face of this statement we cannot help sympathising with the minority and complimenting it on its pluck and confidence.

Much good public money has been spent by this commission in the preparation of plans and specifications, which seems might have been saved if builders' plans are better, more trustworthy and necessary of acceptance.

From whatever standpoint looked from, the necessitous acceptance of the majority recommendation seems to us a reflection on the commission's work, and a certain robbing of a signal world-honor from it.

On the other hand it stamps the designer staff of our St. Lawrence Bridge Co. as a combination whose work

commends itself and whose confidence is not likely to be misplaced.

To engineer Vautelet in his meantime lone stand and in perhaps greater degree, is due also the commendation and public appreciation for a work laid out, his confidence in its stability and usefulness, and his bid for a niche in the temple of fame.

The decision is a momentous one, the more so on account of there being a bridge in the river which like the projected one was intended to span that river.

Bridge designers' and constructors' reputations are at stake, the public safety is involved, the development of our country depends somewhat on it, and money is we presume not being stinted.

Let the best be none too good, let there be a Quebec Bridge, and may its designers receive their due honor.

INVESTIGATION SYSTEM OF PURCHASE.

In the Business Management section of this issue will be found an interesting account of the system of machine tool purchase adopted by a prominent railroad. Pleasing to all engaged in the manufacture and sale of machine tools because ensuring fair competition and recognition of merit, it has also shown profit to those responsible for introducing the system.

Points to be noted are the adaptability of the system not only to other railroads but to manufacturing concerns generally, the quality personnel of the committee, a unit being the superintendent of piecework, and therefore a most appropriate selection to enable that department to be fully efficient.

Such a body gives confidence to the executive that the best available in machine tools is being got for a given outlay and that nothing which can be superseded and scrapped is doing duty on past record. The facilities given to get around and see what is being done by manufacturers admit not only of new and untried specialties being considered, but effectively stops the prejudice and clinging to the well-worn rut so cherished by shop foremen.

Progress and proficiency can only be attained by knowing and seeing what others are doing to help us and recognizing it that way, and any concern that would keep its head in front must nose its way first.

CANADIAN MANUFACTURERS AND EXPORTS.

Some Canadian manufacturers are evidently unfamiliar with methods of extending their export trade. London appears to be the hub of trade and inquiries from all parts of the world are received by the Consulting Engineers and buying merchants in London. United States and German companies, realizing this, take particular care to have their goods known to the merchants in London so that London facilities are offered for the prompt securing of specifications, quotations, etc.

For instance, a firm in India wrote London for information of quotations, etc., on some machinery manufactured in Canada. There was no information available without long delays and a great inconvenience resulted and probably a loss of the order.

Another point in the export trade is the elimination of loose methods in dealing with a foreign purchaser. The Trade and Commerce tells how an order from Japan was lost by one Canadian company because they would not fill the order to suit Japanese conditions. Such a short-sighted policy is harmful not only to that company but to the Canadian manufacturers generally who are looking for an export trade.

WASTES TIME OF MAN AND MACHINE.

On a number of occasions "Canadian Machinery" has drawn the attention of shop foremen, superintendents and managers to the necessity of having sufficient equipment. J. S. Sheafe, Engineer of Tests, Illinois Central R. R., Chicago, Ill., in an article entitled "Care and Selection of Shop Equipment" recently published in "Railway Age Gazette," has the following to say about the use of grinding wheels in railroad shops:

"Have plenty of Grinding Wheels.—Grinding wheels, in most railway shops, are conspicuous by their absence from convenient locations. A machinist would rather continue for a while the use of a slightly dull tool than to bother going, perhaps, the length of the shop and waiting his turn at the wheel. This is hard on the machine, already hard pressed since the advent of high speed steel; also on the work and the man. When it is remembered that the rate of deterioration of a tool when dull does not vary as the work done, but as the square of the work done, there is an abuse all around. Grinding wheels should be placed in all parts of the shop, both machine side and pit side. This makes it inexcusable for a man to work with anything but perfect tools."

A great number of articles included under the heading of "Shop Equipment," may also be included. The above will serve as an example to interest all in keeping the shop at maximum efficiency.

AWAY WITH THEM!

There is too much talk of Ideals. The word is used in sermons and poems and after-dinner speeches. Little souls roll it on the ends of their tongues and lift their mild eyes to Heaven. Surely the truly great have none of them—these ideals.

What is wanted is common decencies—not ideals. The word has too much exquisitely nebulous meaninglessness. Fat men dream of ideals, and in the morning cheat the car conductor. Thin men dream of the same thing and abuse their wives. Lovers think their affinities "ideals," and wake to quarrel about a certain usage in grammar.

There are too many "ideals" and too much self-deceiving. Let us save the word from profanity and hide it until hallowing time has restored its sacred shape, and in the meantime let us collect samples of common decencies, honesty of tongue, and hand, and heart—and put them in a case, lest in a few generations there be none left.

EXPERIENCE AS A TEACHER.

No amount of personal experience can ever make a man perfect. On a few occasions (fortunately they are few) mechanical men have given our subscription men as a reason for not subscribing to a mechanical paper that "they have worked at their business for twenty years and didn't need advice along mechanical lines."

This view is a very narrow one to take. The technical paper does not essay to show a man how to run his plant, but by telling what others are doing, giving news of the mechanical world, descriptions of new machinery, the opinions of other mechanical men, it undoubtedly provides a ready means of improving the knowledge in connection with the conduct of and work in the shop.

No matter how extensive a man's experience may be, he can still learn something from others and the technical paper serves as a means for this interchange of ideas. The fact that a man values his opinions so highly, should naturally lead him to place some value on the experience of others.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

PIPE THREADING MACHINE.

The new double head rapid nipple and pipe threading machine shown in the illustration has a capacity of $\frac{1}{8}$ to $\frac{3}{4}$ inch. inclusive. It reams and threads at one operation, pipes of any length from a nipple up, being quickly threaded on this machine.

It is fitted with the Hall improved die head. The dies are easily made and permit being recut often. Rotary oil pump and drip pans form part of the equipment.

This machine is manufactured by John H. Hall and Sons, Brantford.

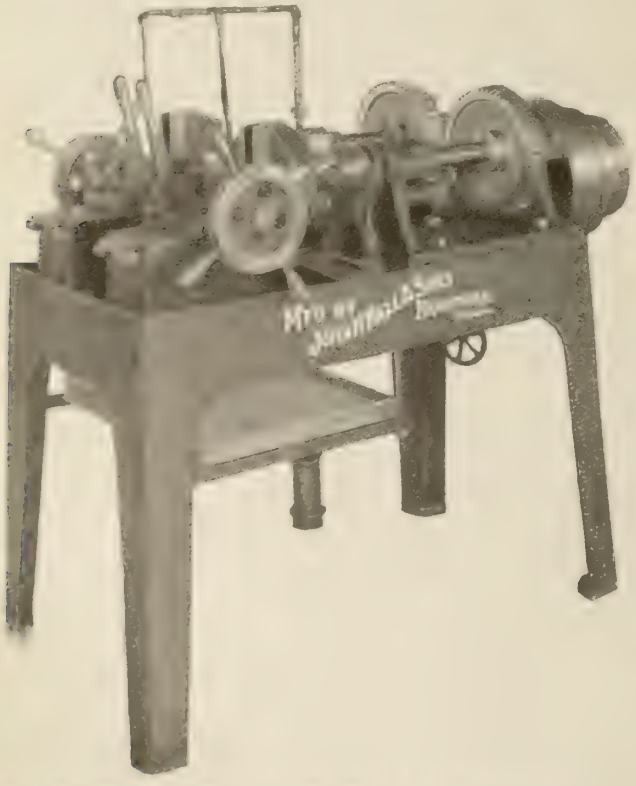
BOLT CUTTER AND NUT TAPPER.

The illustration shows a new motor driven machine made by the Wiley & Russell Mfg. Co., Greenfield, Mass. The machine proper is their standard combination opening die machine, equipped with their well-known patented "Quick Change" opening dies. Electric motor drive is attached to this standard machine. It can be used for nut-tapping, pipe-threading, cutting off, etc.

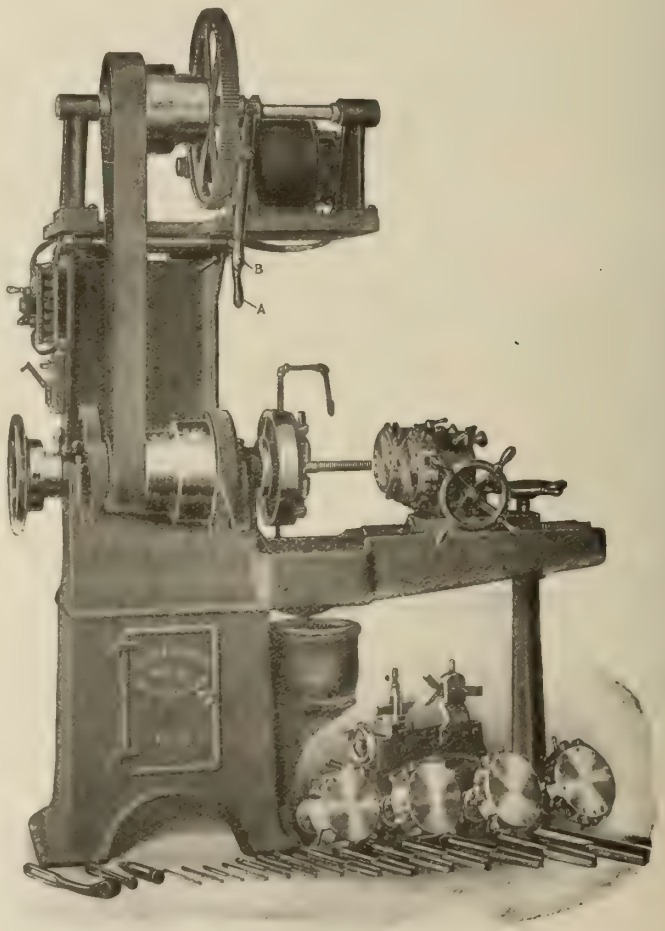
The arrangement is as follows: It consists of a bracket fitted and bolted to the bed on which the motor shelf is secured. This shelf is hinged at back and has finished projecting lugs which rest on cam shaft operated by lever A. By this sufficient tension can be kept on belt at all times and belt can be slackened off when desired to shift it from one step to another on cone pulley. After belt is tightened the cam shaft is locked with a binder.

The lever B, in front of motor controls the clutch in the large spur gear, so that the bolt-cutter can be stopped independently of the motor. The motor is constant speed and back geared and is fitted with a rawhide driving pinion. Motors can be furnished for direct or alternating current, reversing or non-reversing.

The arrangement is strongly and carefully fitted and machine is guaranteed to cut bolts and pipe to 2 inch diameter. A 2 h.p. motor is used. The weight complete is 2,300 lbs.



Pipe-Threading Machine, John H. Hall & Sons, Brantford



Bolt Cutter and Nut Tapper, Wiley & Russell Mfg. Co., Greenfield, Mass.

SOLID ADJUSTABLE DIE HEAD.

Landis Machine Co., Waynesboro, Pa., has recently brought out a new type of die head known as a "Solid Adjustable Die Head." The purpose of this die head, is to take the place of the solid dies now used on any of the screw machines and other types of machines wherein the work is backed out of the die after the thread is out.

The die head is illustrated herewith showing the 1 inch standard size which has a range from $\frac{1}{4}$ inch to 1 inch. It embodies the use of the high speed free cutting Landis die, with a very wide adjustment. The dies are adjusted to and from the centre on radial lines for different sizes and are held rigidly in their seats.

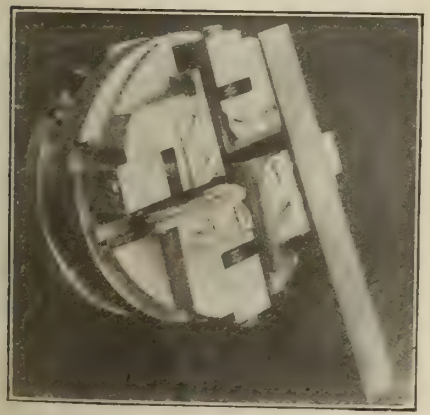
The die head is held in the turret of any ordinary screw machine and trips off by retarding the forward movement of the carriage. This die head will also be made without the tripping device for special requirements. The tripping arrangement is so set that when the desired length of thread is cut, the die head will trip and revolve with the work until the machine has time to reverse.

By using this die very high cutting speeds are readily acquired, equal to the turning and drilling speeds on the other operations of the screw machine, so that the speeds need not be reduced in the threading operation for the accommodation of the die as is the case with the solid dies.

Chasers can at all times be ground to suit the material to be cut; any amount of rake can be given that is necessary, thereby insuring the best possible cutting condition and securing ideal results.

The dies are made from high speed steel and can be ground and reground many times, thus giving a life many times greater than any other solid die, besides never requiring to be annealed, hobbed or retempered, and are readily adjustable to take up wear in addition to the adjustment for different diameters.

One set of chasers can readily be set above or below their rated diameter. For instance, ½ inch (13 thread) can be set to cut 1 inch diameter when de-



Solid Adjustable Die Head, Landis Machine Co., Waynesboro, Pa.

sired, or they can also be set to cut 1¼ inch diameter. The angle in the thread, however, will not be quite ideal, but all that is required for ordinary screw machine work. With other types of die heads a special set of chasers is required each time you wish to cut other than standard pitches. With this head any diameter within the range of the head can be cut with one set of dies so long as the pitch is the same. In very special cases where absolutely correct pitch is required, it would be advisable to use special holders so as to set the chasers on the exact angle to correspond with the angle of the thread. Ordinarily this is not required.

These heads can be supplied in standard sizes with shanks suitable for holders in ordinary screw machines. The ½ inch head is 2¾ inches in diameter, capable of cutting a thread of 1½ inches long. The 1 inch head is 4⅝ inches in diameter, capable of cutting a thread 2½ inches long. Other sizes with special shanks will be made to order.

The dies will regularly be made from high speed steel. In no other type of die can high speed steel be used to the same advantage as can be used in this die, as will be readily apparent on the face of same.

This head is manufactured by the Landis Machine Company, Waynesboro, Pa.

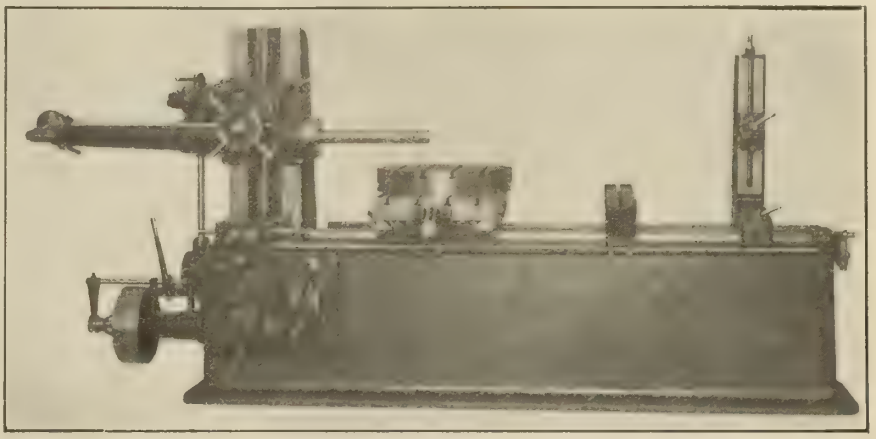
BORING, MILLING AND DRILLING MACHINE.

The machine shown in the accompanying cut is a horizontal boring, milling and drilling machine with tapping attachment and vertical feed.

The spindle runs in solid taper bronze bearings with adjustment for wear, and has a face-plate to receive large milling cutters, etc., for heavy work; it revolves in right or left hand directions and can be started, stopped or reversed instantly, this being convenient for facing, tapping, milling and other operations. The spindle and back gear drive is located between the spindle bearings, bringing the power direct to the work. The lever for operating back gear and the lever for reversing spindle are conveniently located on the spindle head, and they can be engaged or disengaged while the machine is running.

The spindle bar which passes through the spindle, is of unannealed crucible steel, 2½ inches in diameter, has 22-inch traverse, and is fitted with a No. 5 Morse taper. It has power feed in either direction; can be securely clamped for face milling purposes and is operated from the pilot wheel for both hand feed and quick traverse by means of a clutch.

The outer support for boring bar can be clamped securely to the bed, and is readily removed for overhanging work. The spindle head and outer support for boring bar are aligned by means of scale and vernier reading .001. The scales read 1-64-inch and 1-100-inch direct.



Boring, Milling and Drilling Machine, Cleveland Machine Tool Works, Cleveland.

There are 16 head, platen and bar feeds, 8 in number for each position of spindle back gear, are positive geared, and arranged in geometrical progression from .005 to .3-inch per revolution of spindle. All feeds are reversible. All changes of speed can be made while the machine is running.

The machine is made by the Cleveland Machine Tool Works, Ohio.

VERTICAL MILLING MACHINE.

The half-tone shows a new vertical milling machine recently brought out by the Rockford Machine Tool Co., Rockford, Ill. It is adapted to modern manufacturing methods and the production of duplicate parts. The machine is a radical departure from the old precedent, the adjustable knee, which is in common use. The builders claim all the advantages of the adjustable knee with the elimination of their undesirable features.

The column and the horizontal slide for the saddle are made in one casting. By this construction, the table is not adjustable vertically, the top of table being 30 inches from the floor, the same height as a planer platen which is most convenient for the operator in handling castings or other parts being machined. The head bearing on column is fully as large as the bearing to the knee on a machine of corresponding size while the weight of the head is much less and counter-balanced, relieving the bearing of over-hang and uneven strains which rapidly destroy their accuracy.

The general dimensions of the mach-

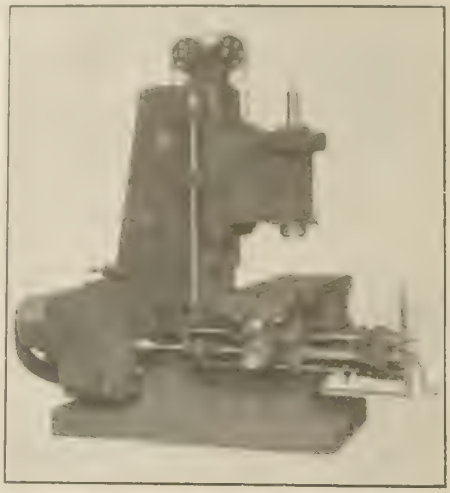
ine are as follows—Distance from centre of spindle to column 15 inches, total length of table 56 inches, working surface of table 14½x48 inches, feet to tables 32 inches, maximum distance of table to spindle 21 inches, minimum distance of table to spindle 5 inches, the head has a vertical movement of 21 inches, and a bearing on the column 19 inches wide by 25½ inches long, the spindle is 4 inches in diameter at taper by 5 inches at upper end. It has an adjustment of 6 inches by means of sleeve and worm gear. There are twelve speeds to the spindle, nine back geared and three [illegible] open belt speeds for small cutters with twelve changes of feeds.

The drive is through a three-step cone pulley, diameters of which are 12, 15½ and 19 inches for 4 inch belt. The speed of countershaft is 390 r.p.m. Three speeds for each step of the cone are instantly obtained through the back gearing by the manipulation of a vertical lever on the side of the machine. The two levers are interlocking, preventing any two conflicting combinations of gears being engaged at the same time. By placing the vertical lever in its neutral position, the sliding gears are all locked out of mesh, then by moving the lower of the two levers to the right, the clutch is engaged with its mate which is out on the end of the shaft carrying the cone pulley and the three-high speeds obtained direct from the cone pulley to the bevel gears on the vertical shaft. Twelve speeds to the spindle are thus obtained which are 13, 16.6, 21.4, 27.4, 35.2, 45, 57.8, 74, 98.3, 121.6, 156 and 200 r.p.m.

The feed is driven by spur gear from the back gear shaft. The clutch for engaging and reversing the feeds is placed on the upper shaft which is the highest speeded shaft in the box. The lever for operating the clutch is conveniently placed in front of the machine. The power from the clutch shaft is transmitted through the slip gears at the end of the machine. Two pairs of these gears are used which are reversible, giving four changes. Three changes for each position of the slip gears are obtained by the sliding gears on the lower shaft which are operated by the lever on the front of the feed box. The feeds twelve in number range from ¾ to 17 inches per minute can be instantly applied to the table, the cross movement of the saddle, also to the head.

The power quick adjustment is a new and valuable time saving device. It is claimed by the builders that actual test of a machine so equipped showed a substantial gain in the production. A lever on the machine reversing the table moved by power. The power is supplied to the reversible clutch by spur gearing direct from the cone shaft. Transmission from clutch shaft is through the angle shaft equipped with universal joints to the feed train in front of the machine.

The operating lever is conveniently placed in front of the machine on the



Vertical Milling Machine, Rockford Machine Tool Co., Rockford, Ill.

right hand side. This is also interlocking, making it impossible for the feed works and the quick return to be engaged at the same time. The device is very simple and its operation is as follows:—The lever is pivoted with lower projection, engaging a rod passing through the shaft which is connected to a sliding collar by key through a slot in the shaft. A shaft passing through the column is connected by yokes at each side to the sliding collar and the jaw clutch on the feed shaft. An outward movement of the operating lever disengages the clutch on the feed shaft and the lever is free to be moved to the right and left, pass the projection on bearing casting, engaging the reversible clutch and applying power for the quick adjustment mechanism. On duplicate parts with an operator constantly on the machine, all movements can be controlled by this one lever, as it will be seen that by pressing the lever toward the machine, the feed is again engaged. However, this in no way interferes with the operation and use of the automatic stops to the longitudinal and cross movements. All slides are fitted with adjustable taper gibs, adjustable endwise to compensate for wear. The saddle slide is double gibbed, having a taper gib on the inside of right hand bearing, insuring perfect alignment when feeding under heavy cuts. All movements of the table, saddle, head and sleeve are provided with graduated collars, reading in .001. All shaft bearings are provided with wool felt oil retainers. A very efficient means is provided for oiling the driving shafts and feed box. Each bearing is connected by a soft brass tubes 5-16 inches in diameter which are brought up to a convenient location and grouped together in an oil cup, with hinged cover.

DOUBLE VERTICAL MILLING MACHINE.

The double vertical milling machine shown in the illustration was built by the Newton Machine Tool Co., Philadelphia. The spindle is 6⅝ ins. in diameter fitted with a No. 7 Morse taper. The construction permits of having only one feed at a time, but sufficient change gears are furnished to give feeds of .1211 in., .2071 in., .285 in., .0892 in., .0554 in., and .0357 in. per revolution of spindle. The feed motion is clutch and the drive is taken from the spur gear mounted beside the driving worm wheel.

The machine has a minimum capacity for cutters 25¼ inches in length and for cutters to a maximum length of 39¼ inches and up to 13 inches in diameter. The minimum distance from the work support to the centre of the spindle is 10½ inches and the maximum distance is 8 ft. 4½ inches. Reverse motion to the fast vertical elevation of the saddle is obtained through a double train of bevel gears engaged by a Carlyle-Johnson friction clutch.

The machine is driven by a 20 h.p. General Electric type DLC No. 2 motor,



Double Vertical Milling Machine, Newton Machine Tool Works, Philadelphia.

having a speed of 450 to 1,350 r.p.m. The motion is transmitted from the motor through a "quride" gear to the large driving spur gear mounted on the horizontal shaft on the side of the upright on which is also mounted a bevel gear driving the vertical spline shaft. The bevel gear on the vertical spline shaft is mounted above the bevel pinion. The stresses are thus counteracted and the thrust on the vertical spline shaft bearing is minimized.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

BELTS AND BELT DRIVES.*

By A. E. B.

THIS concluding article on "Belts and Belt Drives," will treat of the influence of pulleys on belts, the installation of belting, the flapping of belts, the care and use of belting and belt joints.

Influence of Pulleys on Belts.

The outer face of a belt travels faster than the inner, causing compression of the latter and extension or stretching of the former. This process has a naturally injurious effect on the substance and life of the belt and should be miminized to the fullest extent possible, by using large diameter pulleys, those especially with little crown. Centrifugal force as is well known tends to raise the belt from the pulley face with the result that only the centre of belt width makes contact, thereby aggravating the ill effects

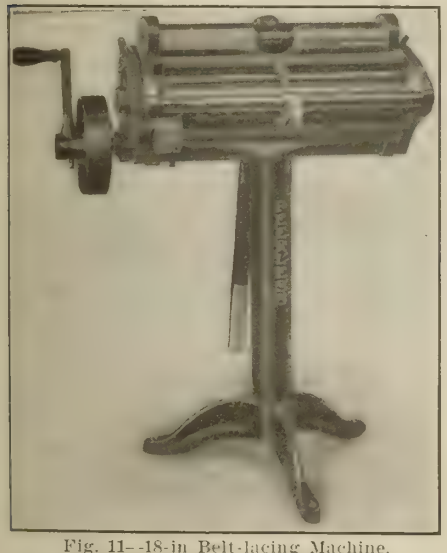


Fig. 11—18-in Belt-lacing Machine.

of tension and compression by a decreased surface.

Pulleys less than 12 inch and 18 inch diameter should be avoided, with single and double belts respectively. Crown pulleys of less diameter than the width of the belt for single belts and of less diameter than one and one-half times the width of double belts should also be avoided. The foregoing remarks apply more particularly to horizontal and flat angle shaft drives.

Horizintal shaft pulleys should have about $\frac{1}{8}$-inch per foot crown, while those on a vertical shaft should have about twice that amount. Flange pulleys chew the belt edges and should be side-tracked in favor of wider and extra crown-faced types. Fast and loose pulleys have also a tendency to distroy the edges of the belt due to the shifting operation.

To obtain a greater amount of power from belts, the pulleys may be leather sheathed, an arrangement admitting of a slack belt and a corresponding increase of durability.

Installation of Belting

In applying new belts, care should be taken that the proper side goes next to the pulley. Belts have what is known as a flesh face and a hair face, the former of which to the uninitiated might suggest itself as the driving face. This is not so however, for the reason that the flesh face being tougher, is better able to stand the stretching already referred to, and the hair side, which is predisposed to cracking, wears better under compression.

The top end of splices connecting the laps should point in the running direction of the belt. Pulleys should be somewhat wider than the width of belt necessary.

Horizontal belts and angle drives up to 45 degrees from the horizontal plane, should have a sag of about $\frac{1}{8}$-inch per foot, and the underside be the driver.

Vertical belts should be pulled tight to ensure grip on the lower pulley.

To connect two horizontal shafts running at right angles to each other by a $\frac{1}{4}$ twist belt, set the pulleys so that a plumb line from centre of face of upper pulley on side where belt leaves it, will strike centre of face of lower pulley also on side where belt leaves it.

Shafting and machinery should be so arranged that belts will run from the former to the latter in opposite directions in order to equalize the strain and pull on the bearings.

Tightening or guide pulleys are applied to the slack side of belts and located nearest the smaller diameter pulley.

Increase of belt width should mean a corresponding increase in thickness, and it is probably true that a thick and narrow belt is more durable and works rather more satisfactorily than does a wide and thin belt. This, of course, has regard to the fact that a certain well defined ratio of thickness to width must exist to ensure stability.

Flapping of Belts.

Flapping of belts is due to a variety of causes, to which the following are among the chief contributors ; the ends of the belt at the joint not being perfectly square, pulleys out of line and set at an excessive distance between centres, high velocity running, which tends to trapping of the air between belt and pulley, thereby diminishing the adhesive contact and the more so if the sag allowed exceeds that already stated under installation.

Sudden and often occurring change of engine speed due to heavy intermittent machine load, invariably causes flapping of belt, and is most generally only capable of cure by increase of flywheel weight, or by the substitution of a flywheel driving pulley for that in use.

The following pulley centres for given belt widths are suggested as a maximum to provide against flapping from this cause. Belts 4 inches and under, 15 feet centres ; belts 4 inches to 12 inches, 20 feet centres ; belts 12 inches to 18 inches, 25 feet centres ; belts over 18 inches, 30 feet centres.

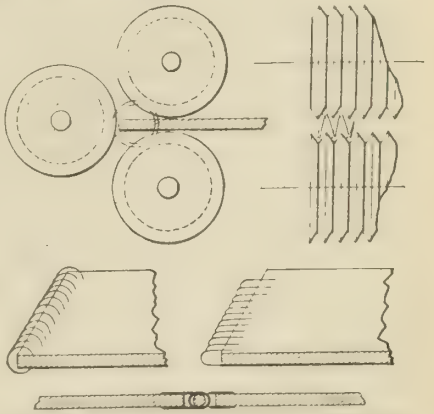


Fig. 12 Details of Belt-lacing Machine.

Trapping of the air may be counteracted by perforating the pulley rim or the belt.

Care and Use of Belting.

Leather belts should be well protected against water and other moisture, by using a waterproof leather dressing. Belts made of coarse loose fibred leather will give best service in dry and warm places. For damp or moist conditions the very finest and firmest leather should be used.

Oil should not be allowed to drip on to belts as it destroys the leather. Leather belting may not safely be constantly used above 110 degrees Fahrenheit.

Belt dressing should only be used as a preservative when the belt inclines to

*Part II. of the second article of the series on Power Transmission Equipment, Operation and Efficiency Subjects.

get dry, and should not be applied to secure unnatural adhesion.

Belt Joints.

It is preferable to joint the ends of a belt by splicing and cementing as it ensures against irregularity of running and consequent jar. Splicings of full width, V-shape and stepped are used on double, triple and quadruple belts respectively For double belts up to 10 inches wide the splice may be 10 inches long and for widths in excess of these the splice may be the same length as the belt width.

Laced belts should have the lace holes punched with an oval punch, whose longer axis is parallel to the belt lengthways. Lacing should not be crossed on the driving face of the belt.

With all forms of belt fasteners care should be taken that their surfaces on driving face of belt are sunk below that face. In our February article various forms of belt fasteners were illustrated and in this, details of a belt lacing machine are described and illustrated. Fig. 11 represents the complete machine equipped for hand or power operation and for use on an 18-inch belt. Fig. 12 shows the leading details which consist of 3 corrugated rolls, operated by a crank, between which is inserted a spiral needle. By revolving the crank the needle is carried through the ends of the belt and makes small perforations into which the coiled wire lacing is afterwards threaded by a similar process to that of perforating by the needle. The coils are afterwards flattened and forced well into the belt and are coupled together at the ends by means of raw hide pins, twine or other material suitable. The rolls and gears are made of the best hardened steel, and all parts are interchangeable.

Fig. 13 represents a leather belt 2½ inches wide laced by the Peerless belt lacing machine, which joint stood a tensile strain of 4,000 pounds without breaking or pulling apart.

Fig. 14 is a descriptive sketch comparison of hand and machine belt lacing, comment being needless.

Conclusions.

As a result of modern experimental work on power transmission by leather belting, much light has been thrown on the subject, with the result that possibly its future treatment will require revision. It appears proved that the greatest allowable belt tension is not constant, neither is the belt velocity even with pulleys revolving at constant speed.

The efficiency of a belt has been shown to be just as high as a good gear transmission, the loss in over-all belt efficiency being largely due to bearing friction, showing that the looked-for improvement should come from that quarter in the shape of ball or roller bearings equipment.

HANDLING ORE WITH ELECTRIC MAGNETS.

Magnetic iron ore is picked from the ground and loaded on cars for the crushers with electro-magnets at the Moose Mountain Mine, Ont. The ore is blasted from the side of the hill. At the bottom of the hill an electro-magnet connected to a crane loads it on the cars and at the same time leaves behind the rock and non-magnetic material.



An Electro Magnet Handling Plates.

The electro-magnet handles 1200 pounds of pig iron at a load and about 800 pounds of iron ore. The economy of the electro-magnet is self-evident. For some time buckets were used but had to be replaced very often at considerable cost. Then too, by the latter method the rock and other non-magnetic materials were gathered up and sent to the crushers. The electro-magnet now effects a saving by leaving these behind.

HOT SHOT.

In announcing their usual Christmas "dividend" to employes, based on 10 per cent. of each employe's yearly earnings, the Crane Co. recently denounced, in no uncertain terms, the practice pursued by some corporations of trying to induce their workmen to become stockholders. We quote their remarks verbatim: "We do not know of a more contemptible, low-down, cold-blooded fraud than the practice of some corporations who endeavor to tempt their workmen, in the disguise of a Christmas gift, to buy below the market price their stock, which has fluctuated all the way from five dollars to eighty dollars a share. If these people had a spark of decency they would never do anything of this sort but would advise their men to put their money into a savings bank where they would be sure that it was safe and would bring them in a small return. Another part of this contemptible scheme is to get their workmen to become stockholders and in that way have their friendship enlisted in their company's behalf and aid them in their unprincipled business methods."—Selected.

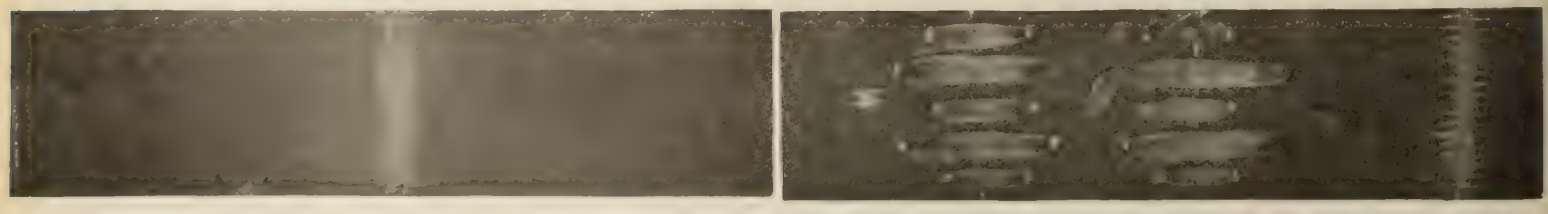


Fig. 14 Comparison of Hand and Machine-laced belts.



TOOL ROOM MANAGEMENT.

By G. C. K.

The efficiency of a machine shop can usually be quickly arrived at from an investigation of the tool room. In shops where efficiency and good workmanship is essential, there will be carefully arranged shelves of jigs, drills, reamers, bolts, dogs, chucks, clamps, wrenches, milling cutters, lathe tools, etc. The rooms are large, systematically arranged and in charge of a man who understands thoroughly tool work, tool grinding,, etc. There is also a system for taking care of the tools and other appliances. It is the intention of this article to suggest a system for shops where one is not at present in use.

There are some tools, bolts, blocks, etc., that are in constant use and tables have been devised so that these may be kept beside a machine and in a handy place for the operator. Certain milling cutters are kept at the milling machine, certain lathe or planer tools at a particular lathe or planer but there should be a central for all tools for general use and all expensive tools. In fact it is better when ALL small tools are kept in the tool room and accounted for by the one in charge. THE EFFICIENCY OF THE SHOP AND ITS PRODUCTIVE CAPACITY DEPENDS TO A LARGE EXTENT UPON THE CHARACTER AND COMPLETENESS OF THE EQUIPMENT STORED IN THE TOOL ROOM.

Situation.

The tool room should be placed as near the departments using the tools as possible, favoring those that, from the nature of their activities, demand most frequent intercourse with it.

Also, the tool room should be in a well-lighted situation. It is more likely to be kept clean and in order if well lighted. The light available should be sufficient for the man in charge to read readily the numbers of the jigs, etc. In addition numbers should be of sufficient size so that they may be easily deciphered. The tool room, for the same reason, should be provided with a good system of artificial lighting. THE QUESTION OF PROPER LIGHTING IS AN IMPORTANT ONE FOR HERE RESTS MUCH OF THE PROBLEM OF SAVING TIME WHEN TOOLS ARE REQUIRED.

Delivery of Tools.

In a small machine shop it is customary to let every man secure any tools he requires, but in larger ones telephone systems and messengers, pneumatic systems, dummy waiters, elevators, speaking tubes, etc., have been installed. Where there are a number of floors, the telephone, speaking tube, dummy waiters, elevators, etc., are of great service in reducing lost time and delays in the delivery of tools, jigs, etc., to a minimum. The National Cash Register Co., Toronto, use a dummy waiter for supplying stock, tools, etc., to other floors and it is found to be entirely satisfactory.

The factory telephone and the pneumatic system of delivery orders, tools, drawings, etc., will be the subject of two articles in succeeding issues of Canadian Machinery. The pneumatic system has been successfully applied to departmental stores and could be applied to factories with equal success and economy of time.

To assist in quick delivery the tool room attendant should not be hampered by closed cupboards. The open shelves are more convenient and are also cheaper to construct.

"Checking" Tools.

IT IS NECESSARY TO KNOW EXACTLY WHERE ALL THE TOOL JIGS ARE AT ANY TIME. Either they are in use in the shop or are in the tool room. In order that this condition may always exist a check system is found to be most satisfactory. The check should be of brass with a hole drilled in it for hanging on a hook provided on the side of the space from which the tool or jig is taken. A certain number of them on which is stamped the workman's number is given to the workman. In plants where this system is in operation it is customary to give the workman ten checks.

The following is the method of operation: A workman desiring a certain jig comes to the delivery window, states what he wants and hands over a check. The attendant hangs the check on the hook provided beside the space containing the jig, delivering the jig to the workman. When the jig is returned the check is handed back.

Classification.

EACH JIG, TOOL, ETC., IN THE TOOL ROOM SHOULD BE CLASSIFIED AND PLACED IN THE RACK SO THAT THE ATTENDANT CAN AT ONCE PROCURE IT. The general scheme of classification devised by Frederick W. Taylor, the author of the well-known volume on the "Art of Cutting Metals," was given in a recent issue of "Industrial Engineering," and is shown in the accompanying table. Subdivisions of it may be made where necessary:

Classification of Tools.

Class

A—MISCELLANEOUS TOOLS, not elsewhere classified.

B—BENDING TOOLS.—All tools for producing changes in shape by bending, folding, spinning, etc.

C—CLAMPS AND HOLDING DEVICES of all kinds, including bolts and screws.

D—DRILLING AND BORING TOOLS.—Tools that remove metal from the interior, such as drills, boring bars, cutters and all appliances relating to them, and lathe boring tools.

E—EDGE TOOLS.—Edge tools for working wood, and tools for working plastic materials, such as clay, molding sand, putty, etc.

F—HEATING TOOLS.—All kinds of tools used for heating, lighting, melting, molding, oil tempering, annealing, drying, cooking, etc.

H—HAMMERS AND ALL TOOLS that work by striking or being struck, such as sledges, tups, etc., chisels, sets, flatters, etc.

L—TRANSPORTATION TOOLS.—All tools used in moving materials from one place to another, such as buckets, boxes, etc., trucks, shovels, wheelbarrows, bogies, brooms, riggers' tools, slings, chains, etc.

M—MEASURING TOOLS.—All instruments of precision, weights, measures, gages, etc., electrical instruments, etc.

P—PARING TOOLS.—All tools that remove metal from the surface by cutting, except slotter and milling tools. (See class D for lathe boring tools.)

R—MILLING TOOLS.—All tools for milling or sawing metal.

S—SLICING TOOLS.—All parting tools and slotter tools.

T—TEMPLATES AND ALL INSTRUMENTS for duplicating work, including jigs and fixtures.

U—ABRADING TOOLS.—All tools for rubbing, scraping, filing, grinding, shearing, punching, breaking, etc.

W—WRENCHES AND ALL TOOLS used for causing rotation.

X—PAINTING TOOLS.—All tools used for covering a surface with an adhesive foreign material, and any for removing same.

According to the Taylor system a tool is designated by the first letters of the words describing the tools. Thus a lathe tool of class P, is 2PRBC, if it is a 2-inch cutting tool, round-nose, blunt and central with the tool or straight. These symbols are stamped on the tool and on the rack or drawer.

Where the Taylor system is used the racks are arranged according to the

classification, A, B, C, etc., and the letters designating the tools are prominently printed on the rack. The size of the tool room, the number of racks.

Conclusion.

A casual perusal of this classification may seem a little too elaborate for the average Canadian shop, but it will be found on a study of it that it may be easily applied. In a number of shops the forging and grinding of tools is entrusted to one man who thoroughly understands his business. Many shops too have shelves for tools and jigs and they are thrown together in a "hit and miss" fashion. It will be found to more than pay for itself if a convenient system is installed with a man in charge. The time saved in securing the jigs and tools will pay his wages and besides there will be a gain by avoiding duplication of tools or loss of them altogether.

Recently a new company purchased a large machine shop in Toronto where there was no system of looking after the tools and jigs. The first work was to gather up all the tools and rearrange the machinery. Racks were built and when the tools were classified it was found that there were two, three and even four tools of each kind, costing from $15 up. THE INVESTMENT IN TOOLS AND JIGS MUST HAVE BEEN ENORMOUS AND COULD HAVE BEEN AVOIDED BY A LITTLE INVESTIGATION ON THE PART OF THE MANAGEMENT AND THE INSTALLATION OF SOME SYSTEM FOR CARING FOR AND STORING THEM.

SYSTEM OF PURCHASING MACHINE TOOLS.

The sytem of purchasing machine tools, which has been adopted by the Chicago, Burlington & Quincy Railroad has invited a great deal of favorable comment among dealers and manufacturers. While it has been the custom of railroads and other large buyers to have committees which consider and recommend specifications or the purchase of machinery, the Burlington committee seems to have more power of initiative and has adopted a more progressive policy.

This committee made its appearance in the trade last fall in connection with purchases for new shops at Havelock, Neb. The committee visited all the Chicago dealers and made an extensive trip among the manufacturers soliciting demonstrations of machines and all the practical information that could be obtained from the experts of the manufacturers. The results were evidently satisfactory to the executive management of the Burlington system, as the committee is continuing its work by carrying through on the same plan occasional purchases for other shops of the system.

It seems that for about 20 years the Burlington has had an "Association of Operating Officers," which holds regular meetings, the chief object of the association being to promote efficiency and to secure general discussion by all the operating officers of proposed improvements. The Tool Committee is a regular committee of this association. It has no power to make purchases for the company, but it recommends all purchases of machine tools, and it usually specifies two or more competing machines before actual purhcase is authorized or bids invited.

This committee is composed of the most capable men for its work in the employ of the company. One member is the company's "superintendent of piecework," who travels over the system promoting piecework in all the company's shops, and at the same time keeping in touch with the progress of shop efficiency on other railroads and in commercial plants.

The committee has grown into an interesting piece of corporate machinery. It affords the executive mangement of the company a safe guide in appropriating money or authorizing improvements, and its successful record has given the progressive men who constitute the committee a degree of initiative that is unusual in railroad shop management. The individual shop foreman or superintendent often hesitates to recommend innovations or improvements, because a mistake in judgment would be a set back in his position with his company which would count more than credit for successful work. As a result of this peculiar phase of corporate psychology the foreman or superintendent is usually content to travel along in a rut, and when new machines are required he recommends those which have been used in the shop for 10 to 40 years, without profiting by the progress of the machine tool industry.

The shop payrolls of railroads in the United States amount to about $250,000,000 annually, while reports show the expendtiure of only $8,000,000 to $10,000,000 for shop equipment. There has been remarkable progress in the past 10 or 20 years in the efficiency of locomotives and train equipment, as well as in track and bridge construction, but the railroad shop has become a form of backwater in the stream of progress in railroad management.

The system adopted by the Chicago, Burlington & Quincy is apparently throwing light on this problem in railroad management. Recently the committee has disposed of a number of old machines, which have been replaced by new tools. Some that were found to have no commercial value in the market for used tools have been scrapped. These are unusual occurrences in the management of railroad shops. The committee has also shown a willingness to recommend the purchase of new tools that have never been used in railroad shops. When its members are out on an investigating trip and are entertained by a machine tool manufacturer or dealer they show a preference for water, while their strict attention to business has occasioned much comment.—Iron Age.

BOOK REVIEW.

Self-Taught Mechanical Drawing and Elementary Machine Design.—By F. L. Sylvester, M.E., with additions by Erik Oberg, associate editor of "Machinery." Published by the Norman W. Henley Publishing Co., 132 Nassau St., New York; size, 5x7½ ins.; pages, 333; illustrations, 218; bound in cloth; price, $2.

This book has been written to meet the demand for an elementary treatise on mechanical drawing, including the first principles of machine design, presented in such a way as to meet the needs of the student whose previous theoretical knowledge is limited. The author's aim has been to adapt the treatise to the requirements of the practical mechanic and young draftsman, and present the matter in as clear and concise a manner as possible. Practically all the important elements of machine design have been dealt with, and, besides, algebraic formulae have been explained, and the elements of trigonometry have been treated in a manner suited to the needs of practical men. In the arrangement of the material, the author has first devoted himself to mechanical drawing, because a thorough understanding of this greatly facilitates further study of mechanical subjects, then attention is given to the mathematics necessary for the solution of the problems in machine design, presented later, and to a practical introduction to theoretical mechanics and strength of materials; and, finally, the various elements entering in machine design, such as cams, gears, sprocket wheels, cone pulleys, bolts, screws, couplings, clutches, shafting, fly-wheels, etc., have been treated. The general arrangement makes possible a continuous course of study which is easily comprehended and assimilated even by students of limited previous training.

Graphite.—The July, 1910, issue of this house organ from the Joseph Dixon Crucible Co., Jersey City, N.J., contains several articles of interest to anyone interested in preservative paints, as this issue is devoted almost exclusively, to examples of what their paints will stand under very adverse conditions, photos being produced to verify their contentions. The paper is a well gotten up house organ.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

MOLDING PROPELLERS IN CORE.

By H. J. McCaslin.

AFTER reading Mr. Eastham's article appearing on page 60, Feb. issue Canadian Machinery,—molding heavy flywheels, which gives one a good opportunity of exercising his imagination as to how the cores are formed, etc., it occurred to me that it might be of interest to some of your readers to know that a similar method is employed in the production of propeller wheels when not exceeding 6 or 7 feet in diameter.

This practice when carefully carried out can be recommended in the making of test wheels where experimental data is desired; also in the production of metal patterns for standard size wheels, for it insures that the casting of all blades shall be as nearly alike as is practical to make them. Further by a slight change in the hub of blade pattern and core box the outfit may be used for a two or three as well as a four-blade wheel.

Nor is the method of molding confined to dry sand just because a core box is used, for by the introduction of a core arbor in the bottom or drag half of core for the handling of this part, a green sand mold may be formed if desired. However as the method of molding herewith illustrated is that of a dry sand steel mold, or what could be properly called a cored mold, our discussion will be along that line.

Fig. 1 shows a cast steel four-blade propeller of the throw back design, 6 ft. 6 in. diameter and 9 ft. pitch, with a chambered and tapered bore through hub.

In studying the arrangement of the core box as shown in Fig. 2, in which the cores are formed it will be noticed that the blade pattern is so placed in the box that the face or working side of blade is down.

This is done that this surface is more apt to be free from dirt or other impurities than if cast in the reverse position.

Attention is called to the hub when making this part of the pattern, for if the hub has an extreme swell or bulge at the centre difficulty may be experienced in its withdrawal from the sand.

For this reason a good practice is to slab or leave loose the interfering portions above and below that they may be drawn separately. Making the sides of the core box in sections as shown will greatly facilitate the core making— as this arrangement permits the tucking, ramming and rodding of the sand to be done from the side, in place of working from the top of core box if it be made entire.

The construction of the box is of little consequence if rigidity and stability is embodied therein, that the pattern may not become misplaced or rammed out of position.

To further guard against any misplacement which is very apt to occur in ramming, the patternmaker should get out and place in the hand of the coremaker such gauge or trial sticks as he deems necessary, and also indicate upon the pattern the point at which they are to be tried for correctness. Attaching a support at the tip of the blade as shown at A is good practice, it will prevent the pattern being rammed down, the depression left vacant thereby is easily filled up when finishing this surface.

Making the Drag Core.

The core-maker takes the job in hand and starts off by placing the lower section of core box upon a good level core plate, placing and securing the pattern in position and trying it for its correct location.

As this portion of the core supports the top or cope part during the drying and assembling of the mold, care should be taken that it is well rodded to hold the sand intact and that the lifting hooks are so placed as to ensure an even lift. With a good liberal silica facing against the pattern this part of the core is rammed up and a parting along the edge of pattern arranged.

But before applying the parting material (paper preferred) it is well to try in place the core arbor used in the cope half to see that it and the parting arrangement conform somewhat, as it is advisable to keep the arbor as close to the pattern and parting as possible.

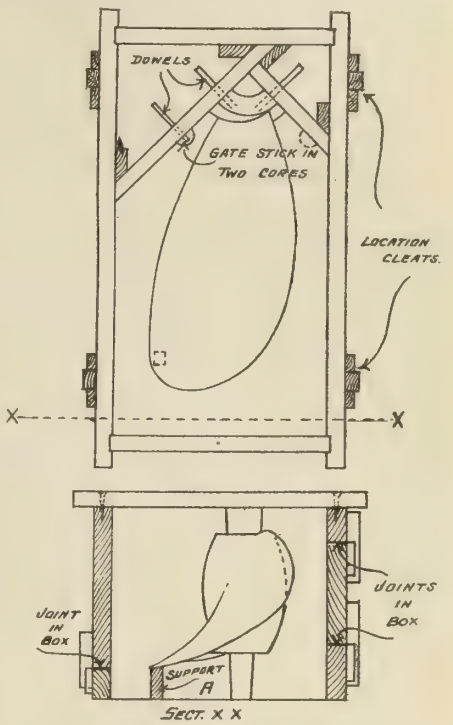


Fig. 2—Arrangement of Core Box.

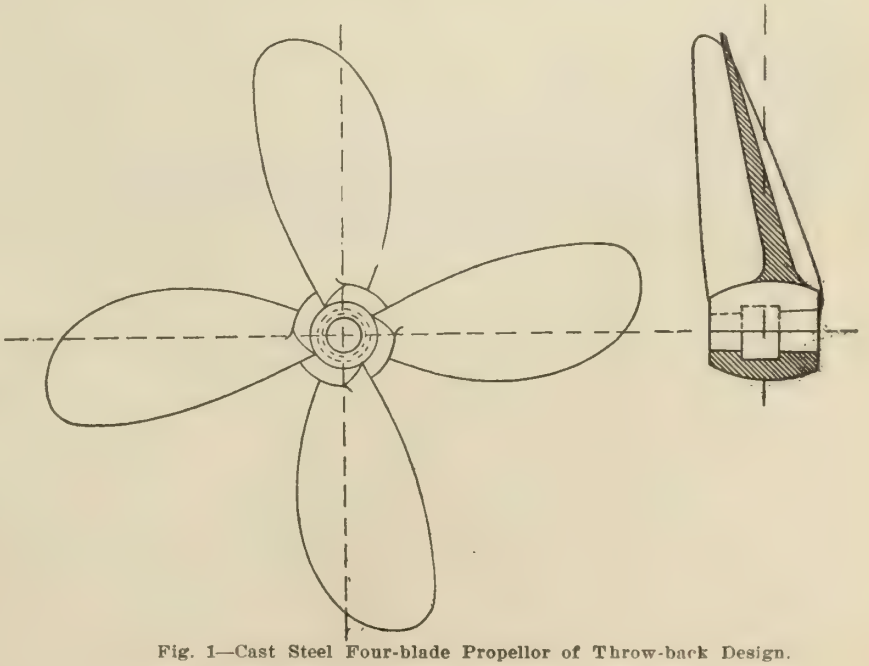


Fig. 1—Cast Steel Four-blade Propellor of Throw-back Design.

The Core Arbor.

The core arbor is cast, its formation consisting of a series of parallel ribs conforming somewhat to the twist of the blade at about the point they are to occupy when in place and connecting two parallel side ribs.

The outline of the core arbor is shown in dotted lines in one of the cores, Fig. 3.

The Core Arbor Pattern.

A pattern for the arbor can be easily and quickly made by setting up the core box and assuming about the position where the parting would be made.

Cut out the two side ribs to conform somewhat to this line and attach them to the side or ends of the box, in about the position they would occupy in the core.

Now cut out the cross ribs to conform to the twist of blade at the point they are to be placed and nail them to the side ribs. By giving the ribs plenty of draft no trouble should be experienced in drawing the pattern from the sand, but owing to its twisted form it cannot be made in an open sand mold.

Making the Cope Core.

With the parting arranged and prepared the silica facing is spread over the blade portion of pattern and tucked around hub, and the arbor placed in position, and blocked up the desired distance This part of the core is then proceeded with by ramming and tucking down and around the arbor and inserting rods where necessary to support the sand.

Provision must be made in two of the cores for the user heads as shown in Fig. 3 the runner which comes at the joint of two cores, and the vent or flow-off at the tip of each blade. This feature of mold is not exactly necessary but is often advisable to place them at such points.

At the completion of this part of the core the box is removed, the cope half of core lifted off and held suspended while the pattern is withdrawn and both parts of the core finished and prepared for drying.

The suspended or cope part is carefully and accurately placed back upon the drag half of core and the whole introduced into the oven and thoroughly dried.

Before assembling the cores they should be carefully inspected to see that no great degree of distortion has taken place in drying, and that the metal cavity is free from any dirt or sand.

In setting the cores together as shown in Fig. 3 upon a good level bed their spacing should be watched very close, for however good your cores may be you cannot depend upon their abutting surfaces bringing them to their correct position.

Make gauge sticks and try the cores at the centre as well as at the outlying points to assure a uniform spacing.

Cores will invariably swell in the drying process and a good practice to follow is to always allow a certain amount of clearance where the cores come together.

This amount of course would be determined or governed by the size of the abutting surfaces, in this case 3-32 of an inch on each surface would not be found in excess.

Fig. 3 illustrates the completed mold ready to receive the weights and the carrying up of the flow-offs. The aggregation of cores are of course firmly backed in with sand.

CONCRETE PATTERNS.

By K. Campbell.

Concrete patterns made of simple concrete and reinforced with steel have been advocated. One of the men who believes in them is Joseph Leon Gobeille, general manager of the Gobeille Pattern Co., Niagara Falls, N.Y. He made them in a small way and found they worked satisfactorily.

With pine wood patterns it was always an easy matter to figure the weight of the casting. This could not be done by putting the concrete pattern on the scales because no two cubic inches were

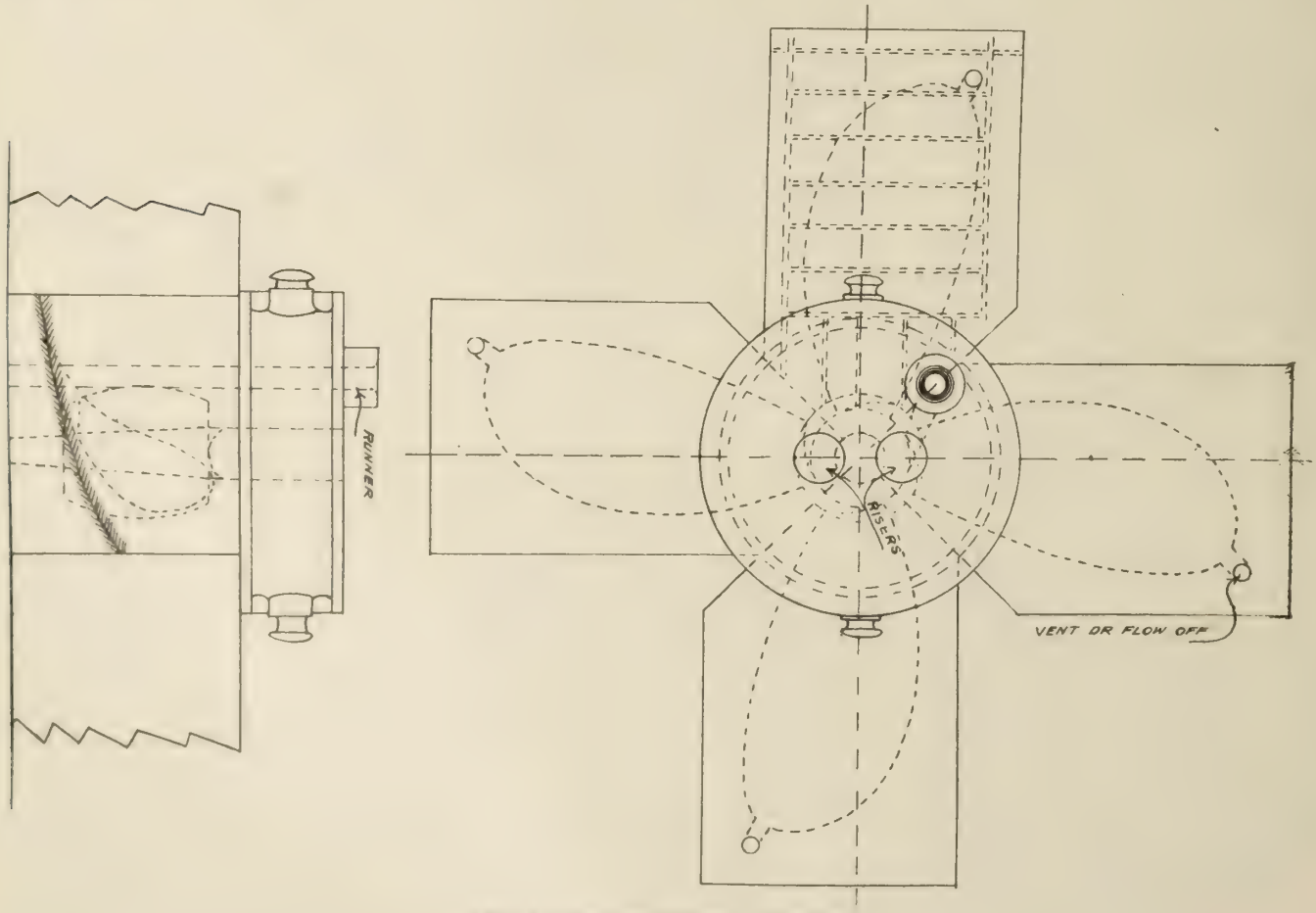


Fig. 3 Cores Set Together, Complete.

identical in weight. But another method of measurement was proposed and has been adopted by the Gobeille Pattern Co., which has given the accurate weight of the casting being obtained.

A square concrete tank was made of known superficial area. This was filled with water and a float with a vertical bar and an easy toggle was rigged up to a dial which was marked in pounds of iron. The decimal for the specific gravity of cast iron per cubic inch was known; the concrete pattern was submerged in the tank, the rising float actuating the pointer on the dial. The displacement of water in cubic inches was translated into pounds of iron on the dial without figuring and with no possibility of error.

PIECEWORK PATTERNMAKING.

By Shellac.

Patternmaking by piecework so far as the writer's observation and experience goes, is not a common practice in this particular trade; as a matter of fact I have only come across one firm who successfully operated the scheme.

The firm in question carried on a large marine engineering and boilermaking business, and made it a rule that the work of each shop department be done on a piecework basis.

It may be as well for me to say here that they had many years experience of the application of the system in other departments before applying it to patternmaking, it as a matter of fact being the last to come under the ban, if I might so speak.

Marine engine building has always appeared to me as rather a hard proposition to be tackled on piecework, and in the case of the firm in question, it was perhaps more so than ordinary. Their business practice was not in the tramp steamer line, where low piston speed, everything chunky and strong could be relied upon to gradually find its bearing without much risk and with the minimum of fitting to begin with. Conditions were rather just the reverse, being altogether high piston speed, quick revolution, high pressure, subject to severe test and inspection and likely to show up defects such as might be expected from a piecework system.

Suffice it to say, piecework was and is still a success in their experience, inclusive of patternmaking.

Marine work of the larger class especially lends itself I think fairly well to piecework patternmaking. Firms who make a speciality of a particular class of machinery usually find it to fluctuate between certain well defined limits of minimum and maximum size. This being so and the designs being in all cases similar, affords an attractive opportunity for the exercise of piecework.

The pattern staff consisted as a rule of from 30 to 36 men who worked in squads on the various jobs.

A similar system to that practiced in a large drawing office where checkers are employed, was adopted; there being two pattern checkers who were held responsible for measuring up the work when complete, and whose O.K. was the pass to foundry. Errors of construction, of course, were pointed out and put right by the constructors on their own time. The checkers were paid time for their work by the firm, being in no wise sharers of the squad contract money.

No question of the cheapest method of making the pattern, or of the proper construction for easy moulding and the securing of a reliable casting, required discussion. This as already pointed out was due to the work being standard type throughout.

The operation of this patternmaking piecework gave satisfaction all round, the individual members of each squad earning time and half as against ordinary time rates, and the employers gaining in better delivery and increased output.

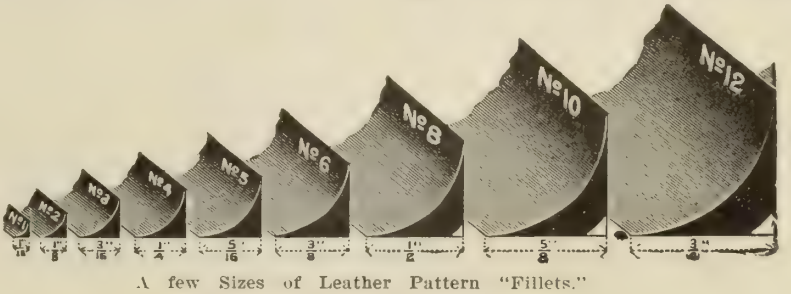
Successful piecework patternmaking calls for first-class tradesmen, and while in some cases there would be no question of successful outcome, methinks its general adoption would bear hard on many second-raters.

LEATHER PATTERN "FILLETS."

By Beeswax.

Fillets are now used on all patterns except some very simple ones and are placed in all corners so that there may be no sudden changes in the direction of the metal. The leather fillet has almost altogether superseded beeswax and other material for the purpose.

Leather fillets can be bought from 1-16 inch up, the illustration showing a few of the sizes. They are pliable and are very quickly and easily applied.



A few Sizes of Leather Pattern "Fillets."

The following system should be followed to obtain best results from leather fillets:

(1) Cut to length and lay face downward on a board.

(2) Brush the glue over it easily. Use a good quality glue. For iron patterns use shellac varnish.

(3) Rub into place using a stick cut the shape of the fillet.

(4) Remove surplus glue with a sponge or rag dipped in hot water. The hot water in the outer glue pot may be used where an electric glue pot is not used. Care must be taken not to wet the pattern more than absolutely necessary. When glue is removed dry the parts that have been wet.

(5) When dry sandpaper in the usual way.

Do not use nails or tacks as they draw the fillet and make an uneven surface. Sometimes castings have their neat appearance spoiled by carelessness in inserting the fillet. In a number of cases that have come under observation this has been due to nailing the fillet in place.

MOTOR CAR BEARING METAL.

According to the "Foundry," a formula for a first-class tin babbitt, suitable for severe service, such as street car motor bearings, can be made as follows: Melt 435 pounds of Banca tin in a babbitt kettle and throw on the surface, finely powdered, soft coal. While the tin is melting place a clean crucible in the brass furnace and charge therein 25 pounds of copper; when red hot, add ¼-pound soda ash, a little salt and several handfuls of charcoal. Permit the copper to melt and to become hot, then add 1¼ pounds of bright tin plate, in small strips. Do not drop in all the tin plate at once, as when it becomes hot it will ball and weld together and will, therefore, be in such a condition that it can only be melted with difficulty. Add the tin-plate strips as gradually as possible, and stir between additions, so that all the iron is melted, and to insure this, it may be necessary to superheat the copper for a short time. Then add 6 ounces of sulphur, stir thoroughly, after which add 35 pounds of antimony, and when disssolved, withdraw the crucible and pour the contents into the melted tin, stirring as much as possible, meanwhile.

IS THIS TO BE YOUR HISTORY?

"Out of the chaos of mediocrity he came, up through the murk of the foundry, the clangor of the machine shop; up by brawn and brain to the Superintendent's chair."—Futrelle.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

EDMONTON, ALTA.—The Can. Nor. Ry. are preparing to spend $30,000 in extending their shops here. The plans call for an addition of six or eight locomotive stalls, and also additions to the shops.

VANCOUVER, B. C.—A well-known Montreal structural steel concern contemplate the erection of a branch steel and iron plant to supply the western trade. They have secured several options, chiefly on the Fraser river, near Port Mann.

GUELPH, ONT.—The Canada Gate Co. will locate here, and erect a plant to manufacture iron gates. They have secured temporary premises until their factory is completed.

HAMILTON—The Oliver Chilled Plow Works Co. will spend $600,000 here this spring enlarging their plant. They have taken out a $200,000 permit for buildings to be erected immediately.

MONTREAL—The Wilson Brothers Motor Co. has secured supplementary letters-patent, changing its name to the Motor Import Co. of Canada. The company is the Canadian representative of the celebrated Franklin air-cooled cars, and of the well-known Hudson, Thomas and Knox cars.

GODERICH, ONT.—The American Road Machine Co. of Canada, have made arrangements with the Hamilton Machinery Co. to sell their entire output, and will now give their undivided attention to their manufacturing business.

KINGSTON, ONT.—The North American Smelting Co. have purchased a site and will erect a lead smelter to treat the ore from their mines in Loughboro Township.

RIDGETOWN, ONT.—F. Eberle, of Morpeth, has taken over the machine agency lately conducted by W. Wilson.

PORT MANN, B. C.—The B. C. Steel Co. will establish a $10,000,000 plant here, and construction will begin this spring. French capital is behind the undertaking.

NEW WESTMINSTER, B. C.—The Drop Forge Manufacturing Co. will erect a tool factory here this spring and will employ 100 men. They will turn out all kinds of tools, including chisels, hammers, wrenches, etc. $125,000 is being invested as a starter.

OTTAWA, ONT.—The Board of Control has accepted the tender of Thomas Lawson & Co. for castings, $3.25 per 100 pounds.

CANORA, SASK.—A. Anderson and D. Gibney will commence the erection of a machine shop here early in the spring. A consignment of machinery is already on hand.

EDMONTON, ALTA.—Commencement has been made by the Edmonton Iron Works, on a contract covering five years, to manufacture 1,000 plows per year, from the Rountree patent. Special machinery for the manufacture of the plows is being installed.

NORTH BAY, ONT.—Fire damaged the C. P. R. car repair shops here recently, to the extent of $1,000.

EXETER, ONT.—Connor Bros. have acquired a site and will erect a factory here to carry on their machine business. It is their intention to go more extensively into the manufacture of air-cooled gasoline engines.

WINDSOR, ONT.—Windsor has secured two more important industries, the Canadian branch of the Maloney Electric Co., and the plant of the Canadian Winkley Co., a branch of a Detroit concern. The Maloney Co., which manufactures electrical machines, will build a $10,000 plant at once, while the Winkley Co., manufacturers of brass goods, will erect a $10,000 plant some time this year.

MONTREAL, QUE.—The Canada Ford Co., of Montreal has secured the contract for the supply of the electric cars required for the street railway system to be established by Regina as a municipal enterprise. The company is having the cars manufactured at the works of the Brush Co., in Loughborough, England. This is the first time an English street car has entered the western Canadian field, and it is probable that as an outcome the company will establish branch works in Montreal for supplying the Canadian market.

MONTREAL, QUE.—The "Belgo-Canadian Steel, Ltd." has been granted a charter, with an authorized capital of $5,500,000. The chief business will be general foundry work.

OTTAWA, ONT.—It is announced that a steel plant will be erected here by American and Canadian capitalists. They have purchased a site in the Bayswater district and will build in the spring.

FORT WILLIAM, ONT.—The Lumby-Stenhouse, Ltd., of this city, have opened a new plant, a foundry and machine shop, where anything in iron or brass castings can be made.

SACKVILLE, N. B.—The Charles Fawcett Manufacturing Co. contemplate making extensive improvements in their foundry plant this year.

BRANTFORD, ONT.—The gales here during the recent storms proved disastrous to several industries. The Ham & Nott Manufacturing Co. place their loss at $1,500. The company is putting up large additions to its works, consisting of a molding shop, machine shop, etc. The roof of the machine shop was partially demolished, while the molding shop is a wreck.

HESPELER, ONT.—Frank Roelofson has purchased the castings, tools, patterns, unfinished stock, etc., of the defunct Parkin Elevator Co.

REGINA, SASK.—The Regina Tractor Co. will erect a plant here, at a cost of $100,000.

TORONTO, ONT.—Mr. Robinson, of the Imperial Machine Co., of London, Eng., and New York, is here supervising the equipment of the Canadian factory and office for the manufacture of their patented machinery. The Toronto factory is getting equipped with a view of completely manufacturing every part of their machinery for the Canadian market with Canadian material and labor.

KINGSTON, ONT.—The Wilbur Iron Ore Co. have made arrangements for the construction of a large concentrating plant here. The cost of the plant will amount to between $75,000 and $100,000. The company will open up offices in the city on March 1st.

LONDON, ONT.—The directors of the London Street Railway have decided to put in a new steam plant.

NEW WESTMINSTER, B. C.—Work will soon be commenced on the plant of the Western Steel Corporation, on the Fraser river site. The corporation has purchased 300 cars of iron ore.

TILLSONBURG, ONT.—The Maple Leaf Harvest Tool Works are running to their full capacity at present, and cannot supply the market. The company intend doubling their capacity and largely extending their present plant.

TILLSONBURG, ONT.—The McCrea Foundry, purchased recently by the English firm of Taskell & Ormerod, is devoted almost exclusively now to the manufacture of gasoline engines. The firm hopes to soon rebuild the foundry, replacing the frame building with a brick structure, and otherwise improving and enlarging it.

WESTMINSTER, B. C.—Several Pacific coast steel and coal capitalists, representing the British Columbia Steel Co., are making application at Ottawa for a charter for the establishment of a $10,000,000 steel plant near here.

HALIFAX, N. S.—The I. C. R. has been asked to re-open the mechanical workshops here, closed some time ago.

MONTREAL, QUE.—The Joliette Steel and Iron Foundry Co. have opened offices at 371 St. James St. here. They will manufacture various classes of iron and steel castings. The president of the company is S. Vessot, of Joliette, and the vice-president, A. Baillot, of this city.

VICTORIA, B. C.—"Warden King, Ltd." has been granted an extra-provincial company license.

MONTREAL, QUE.—The corporation shops here were recently damaged to the extent of $5,000.

LONDON, ONT.—The London Foundry Co. intend erecting a large addition to their foundry here.

MONTREAL, QUE.—In view of the amount of large orders received, the Dominion Bridge Works are contemplating large additions to their plant here.

NEW WESTMINSTER, B. C.—A. Goldberg, of the Vancouver Junk Works, has purchased a site at Steel City, from the Western Steel Corporation, with two hundred feet of waterfrontage, immediately below the site of the proposed steel works. His plant is to be one of the many subsidiary companies to the steel works.

PORT MANN, B. C.—It is announced that the C. N. R. have decided to erect their B. C. car shops here. Several shipments of steel, supplies, etc., are already here.

MONTREAL—The Y. M. C. A. will erect a $300,000 building here on Drummond St.

ST. BONIFACE, MAN.—G. M. Ellis is contemplating the erection of a $1,250,000 automobile factory here. If erected, 1,400 horsepower will be required in connection with the machinery. Mr. Ellis has secured an option on 30 acres of land east of the Seine river, to be used as a site for the proposed building.

OTTAWA, ONT.—The Government has extended invitations to all the leading British and Canadian shipbuilders to inspect the plans and put in tenders for the ten new vessels of the Canadian navy, namely, four Bristols and six destroyers of the latest improved type. Following the rule of the Admiralty, the tenders are not being advertised, as details have to be kept secret, and only firms in whom the Department has confidence will have access thereto. It is stipulated that all the vessels must be built in Canada. The tenders, which must be in by April next, will be gone over by the experts in the Naval Department. In sending out these invitations, the Department has been strictly impartial, no distinction nor discrimination whatever being made between party firms.

CHATHAM—A new foundry is being opened up here for making grey iron, brass and aluminum castings, by the Ideal Foundry Co. Thos. Woods, of the Buhl Iron Co., Detroit, and Chas. Woods, of Chatham, are in charge of the foundry.

OTTAWA—A report states that the G. T. R. have extensive plans for the rebuilding of their shops here.

WESTMINSTER JCT., B. C.—It is reported that the C. P. R. intend establishing roundhouses, freight sheds and car shops in Coquitiam, near here. It is also understood that the C. P. R. plan to electrify their line between Westminster Junction and Vancouver and between the Junction and New Westminster.

PORT MANN, B. C.—As announced in a previous issue of Canadian Machinery, the C. N. R. shops will be erected here. About 500 men are clearing land for the C. N. R.

LINDSAY—The Sylvester Mfg. Co. has been re-organized. J. B. Tudhope, Orillia, will be associated with the new company.

ELECTRICAL NOTES.

CALGARY, ALTA.—Tenders will be received until March 22 for one 1,500 K.W. turbo generator set, with condenser, etc, one 100 K.W. exciter and switchboard, complete, three 1,000 K.V.A. single-phase transformers, 12,000 to 2,300 volts, with switching gear, etc. W. D. Spence, city clerk.

FREDERICTON, N.B.—Notice is given that at the next session of the legislature application will be made for the incorporation of a company to be called the St. Leonards Electric Co. The object of the company is to carry on a general lighting business in the parish of St. Leonards, Madawaska Co.

VICTORIA, B.C.—Certificates of incorporation have been issued to the "Albernie District Electric Light and Power Co.," "Consolidated Electric Heaters, Limited," "Cranbrook Garage Co." and the "Lillooet Power and Light Co."

TORONTO, ONT.—The "Electrical Maintenance & Repairs Co." have obtained a charter.

TORONTO, ONT.—The "Ross Motor Car Co." have obtained a charter.

MONTREAL, QUE.—The "Canada Electric Co." has been dissolved.

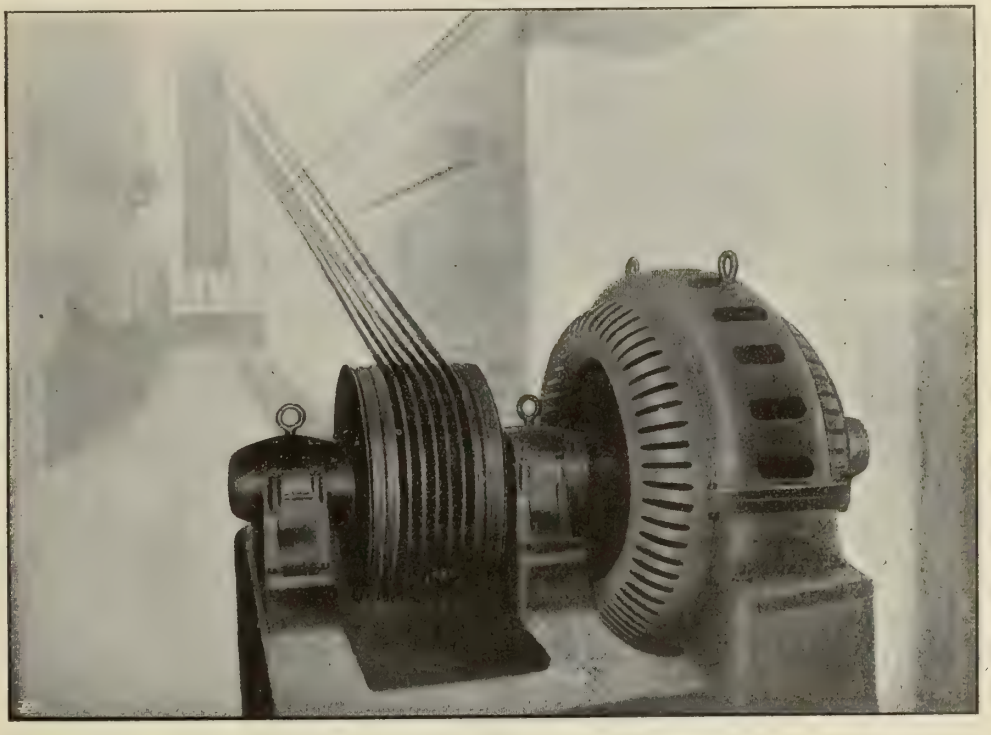
MERRITT, B.C.—The electric lighting plant here has been completed and has a capacity of 1,150 lights. Provision has been made for extensions.

PORT ARTHUR, ONT.—The Kaministiquia Power Co. have decided to double the capacity of their plant owing to an excessive increase in business.

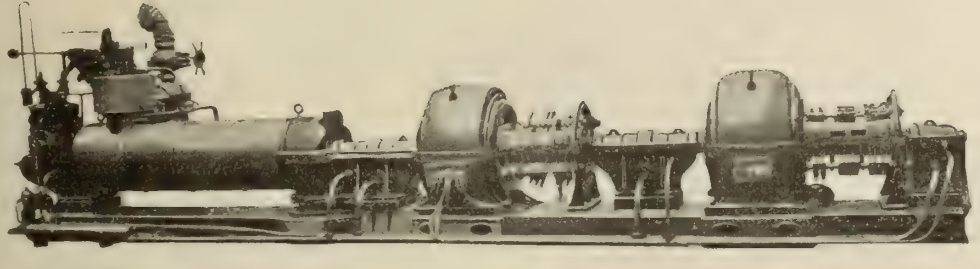
PORCUPINE CITY, ONT.—The Symmes-Timmons Co. has a contract to develop 3,000 horsepower here. They are erecting dams and putting up power stations on the Mattagami river. Fifteen teams are now employed in drawing in machinery, wire and cement with other material for the works. It is expected that the contract will be finished by June 1.

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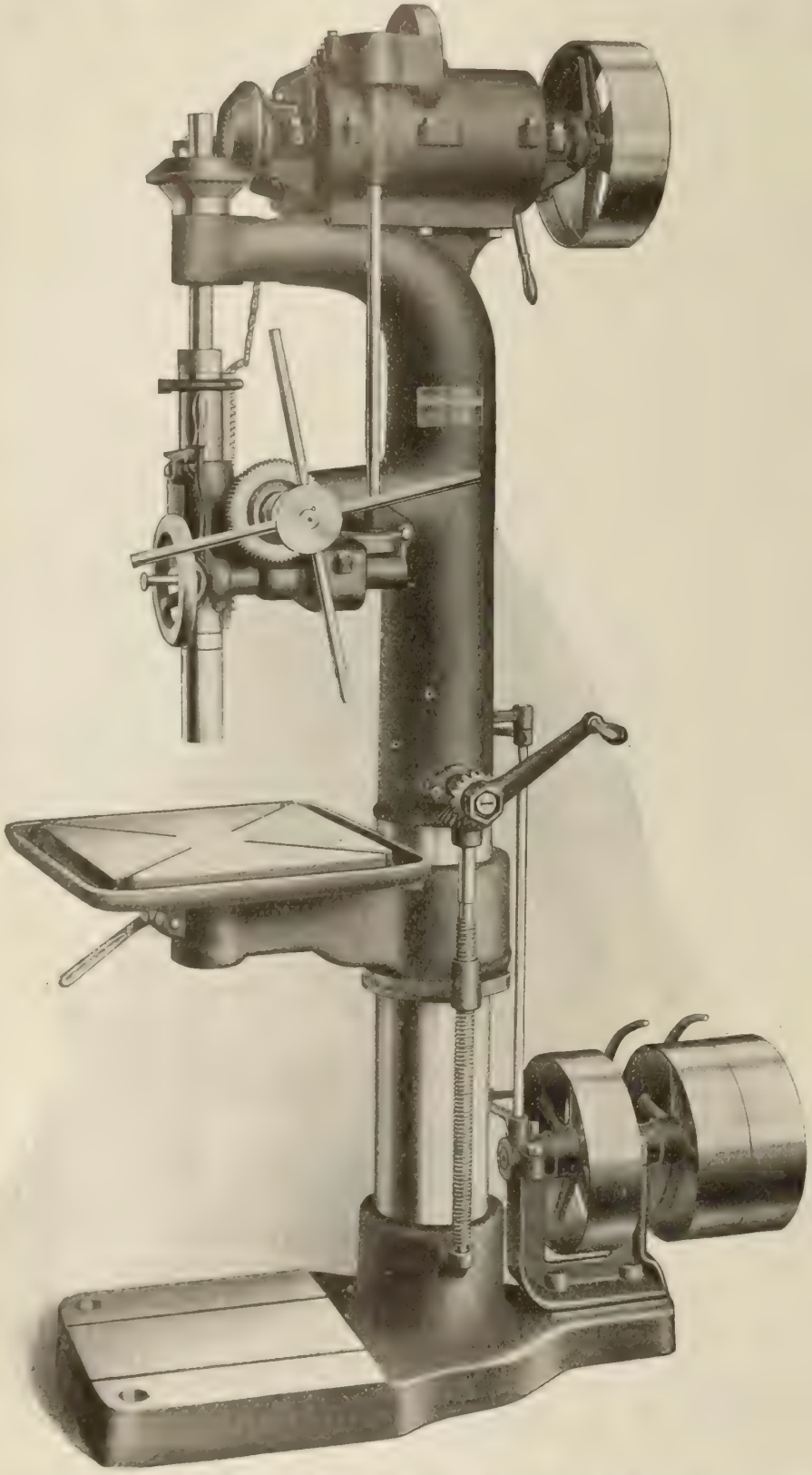
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MONTREAL, QUE.—According to recent estimates the St. Lawrence, as a whole has a capacity of ten million horsepower, and the Ottawa River, 2,375,000, most of which is at present undeveloped.

KINGSTON, ONT.—The municipal light plant made a net profit of $18,000 in 1910, the largest surplus in years. Electricity was produced at 1.61 cents per kilowatt hour, a reduction of a quarter of a cent over 1909. Gas was produced at 42 cents per 1,000 cubic feet. In 1909 it cost 47 cents.

HAMILTON, ONT.—The report of the Dominion Power and Transmission Co. showed a prosperous year. The assets of the company are $19,355,247, and it has to the credit of profit and loss $1,019,689.

MONTREAL, QUE.—Plans will be ready by the end of March for the new power house for the Saraguay Co. They include specifications for two steam turbines of 4,500 maximum h.p. capacity each, boilers and general equipment.

LONDON, ONT.—The C.P.R. are making improvements in their yards here. An up-to-date round house is being constructed in the east end yards. A large amount of the finest machinery will be installed and power will be obtained from the city.

ST. JOHN, N.B.—Ontario capitalists are behind a scheme to erect a power plant at the reversing falls of the St. John.

CALGARY,, ALTA.—The city will submit a by-law calling for an expenditure of $380,000 on electric light extensions, including the erection of substations for receiving hydro-electric power from the Calgary Power Co.

EDMONTON, ALTA.—Formal application has been made to the Dominion Government by the city of Edmonton for power rights on the Grand Rapids on the Athabasca River. Plans filed with the application show a maximum power if all the dams are built of 60,000 horsepower. Edmonton hopes to interest the Government in a hydro-electric scheme. If this is impossible the city hopes to be able to reserve rights until able to build the plant and distributing power itself.

RENFREW, ONT.—Engineers of the Hydro-Electric Commission have visited the upper lakes of the Bonnechere River looking for sites for dams for storage purposes. The town is expending $150,000 for power development.

OTTAWA, ONT.—It is estimated that the expense of developing and utilizing the Trent River powers by the Electric Power Co. will be a sum in the neighborhood of $15,000,000.

EDMONTON, ALTA.—The Diamond Motor Co., Calgary, capitalized at $10,000, has been incorporated.

WINNIPEG, MAN.—The Winnipeg Electric Railway Co. has let the contract for their new power plant to the Canadian General Electric Co. The plans call for a rated capacity of 12,000 horse power and a maximum capacity of 17,000 horse power, ready for delivery by August 1, next. The generator will be driven by Curtis turbines, and the equipment will be installed in four units of 3,000 kilowats each.

ST. BONIFACE, MAN.—The E. B. Reese Engineering Co. has secured the power contract here for a period of ten years, beginning Dec. 31, 1912. The price for power is to be $18 per h.p. up to 3,000 h.p. and over 3,000 h.p. and under 4,000 is to be reduced 25 cents per h.p. for all power used; and for every additional 1,000 h.p. used the price is to be reduced an additional 25 cents. After 15,000 h.p. is used the price is to be $15 per h.p.

New Companies.

MONTREAL, QUE.—Williams and Wilson, Limited, have been incorporated to do a general business in manufacturing, buying and selling machinery and machinists' supplies. A. R. Williams, merchant, Toronto; F. C. Wilson, merchant, W. A. Wilson, barrister, M. B. Bronstetter and E. Kingsland, salesmen, all of Montreal. Head office here.

ST. JOHN, N.B.—The St. George Pulp and Paper Co., of Hudson Falls, N.Y., capital $460,000, are applying for incorporation in New Brunswick.

TORONTO, ONT.—Standard Chemical Iron and Lumber Co., of Canada, Toronto, incorporated, capital, $6,000,000. Incorporators, J. Wood and T. W. Lawson, barristers, both of Toronto.

MONTREAL, QUE.—Belgo-Canadian Steel, Limited, Montreal, Que., incorporated, capital $550,000. Incorporators, E. Van Acker, importer; A. Menager, engineer; F. A. Beique, advocate, and L. J. Beique, all of Montreal.

HAMILTON—The Climax Good Roads Machinery Co., Hamilton, incorporated, capital $40,000. Incorporators, J. Robinson, manufacturer, W. J. Robinson, drug clerk, both of Hamilton, Ont.

WINNIPEG, MAN.—The Winnipeg Steel Granary and Culvert Co., capitalized at $100,000, has been incorporated to manufacture corrugated steel products, chiefly for railroads and municipalities. They will have a plant here and a branch at Regina. Incorporators, L. Crossen and P. Clarke, both of Cobourg, Ont.

MONTREAL, QUE.—The "Central Canada Iron and Steel Corporation," capitalized at $500,000, head office here, has been incorporated. They will carry on the business of iron masters, steel makers, steel converters, smelters, engineers, iron founders, etc., and deal in plant, machinery, implements, etc., and construct bridges, furnaces, saw mills, hydraulic works, electrical works, shops, etc. G. V. Cousins and O. B. MacCallum, barristers, S. T. Mains, accountant, P. F. Brown, secretary, W. R. Ford, clerk, all of Montreal.

BROCKVILLE, ONT.—The "Brockville Construction Co.," capital $100,000, has been incorporated here. This company will require machinery, tools, engines, boilers, plants, implements, patterns, rolling stock, etc.

OTTAWA, ONT.—The "Canadian Quarries and Construction Co." capitalized at $2,000,000, has been incorporated with head office here. They will carry on the business of engineers, foundrymen, machinists, tool-makers, boiler-makers, etc., etc. J. Black, broker, R. T. Mullin, barrister, both of Montreal; S. Bilsky, jeweller, G. C. Hurdman, lumberman and J. O. Carss, barrister, all of Ottawa.

OSHAWA, ONT.—The Matthew Guy Carriage & Automobile Co., of Oshawa, the outgrowth of the long-established carriage business of that name has been incorporated with $250,000 capital stock. It will produce a 30 horse-power touring car and a one-ton truck.

MUNICIPAL.

CARLETON PLACE, ONT.—The council is getting information concerning the proposed waterworks system to be established here.

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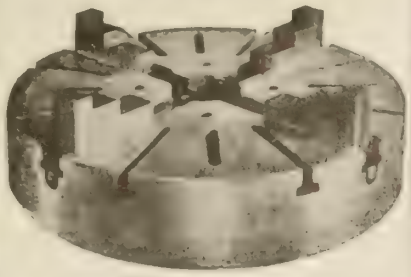
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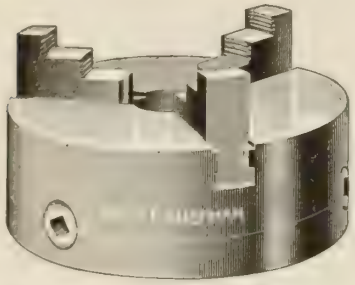
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WELLAND, ONT.—The water commission has secured a water power privilege on the east side of the canal and will build a large modern waterworks plant. A 3,000,000 gallon pump and an electric auxiliary power plant will be installed.

CALGARY, ALTA.—The city is submitting by-laws to the ratepayers calling for the following expenditures: incinerators, $120,000; asphalt plant, $20,000; conduit system, $60,000; waterworks extensions, $245,000; service connections, $40,000; electric light, $380,000; and fire station, $75,000. Total $940,000.

VANCOUVER, B.C.—The civic authorities have presented an application for water rights on Seymour Creek covering the establishment of a storage system on the stream which will enable the installation of supply mains capable of fully meeting the demands of the population of Great Vancouver in the years to come.

NORTH BAY, ONT.—A new electric pump will be installed at the waterworks in the near future.

VICTORIA, B.C.—Plans for the extension of the sewer system are being prepared by the engineer. The ratepayers will probably be called upon to authorize an expenditure of $250.000.

LONDON, ONT.—The Springbank pumping station will be equipped with electric machinery by the first week in March. There will be two pumps with a capacity of 3,000,000 gallons each. The synchronous motors will be of 250 h.p. capacity. The installation of the electrical machinery means that the steam plant at Springbank will be done away with.

CAMROSE, ALTA.—The municipality is installing a new waterworks and sewage system.

NORTH PORTAL, SASK.—The C.P.R. have decided to solve the water problem here; and during the coming summer will install a pumping plant to cost $50,000.

QUEBEC, QUE.—The city is making a strong bid for a big shipbuilding plant, one which is prepared to undertake the construction of the largest warships. Hugh Russel is acting for the company enquiring. He desires to establish yards here, so as to be able to tender for the new ships of the Canadian navy. It was decided to offer an exemption from taxes for 20 years, as well as a liberal bonus should the company locate here.

PRINCE RUPERT, B.C.—Surveys have been completed here with a view to forming plans for the proposed new waterworks.

SCOTSTOWN, QUE.—A by-law providing for a new sewerage and waterworks system will be submitted to the ratepayers on the 6th of March.

OTTAWA, ONT.—The waterworks committee has awarded the tenders for supplies for the year. It is estimated that about $5,000 worth of piping, castings, brass, oils, etc., will be required. The tenders accepted were: Cast iron pipes, A. W. Fleck, representing the Canada Iron Co., $11,583.40; special pipe castings, the Canada Iron Co., $2.70 per cwt.; hydrants, Chaudiere Machine Co., $38.50 each; oils and grease, Capital Warehouse Co., $390.50; valves, Chaudiere Machine Co., $1,148.15; lead pipe, McKinley & Northwood, $1,801.10; brass, Robt. Mitchell & Co., Montreal, $1,915.50.

WINNIPEG, MAN.—Prominent business men here are urging the city to instal a municipal gas plant. This is the result of the high present rate, namely $1.20 per thousand. The city will probably decide to do so, seeing that the electorate voted $700,000 for a gas plant in 1904.

TORONTO, ONT.—The city will, shortly, float a loan for one million dollars to meet the cost of installing the hydro-electric system. So far $700,000 has been spent upon the system within the city limits; this was secured by local loans. Two years ago the city secured authority to issue debentures for $2,750,000 for the installation of the system.

VANCOUVER, B.C.—The announcement is made that the $400,000, voted for the waterworks extension, is inadequate and another by-law will be submitted in the near future asking for $223,000.

VANCOUVER, B.C.—City Clerk McQueen is calling for tenders for the supply of brass goods for the waterworks department.

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OTTAWA, ONT.—A by-law may be submitted to the people shortly to authorize the expenditure of $195,000 for waterworks purposes. For the completion of the work on the aqueduct $150,000 is needed and over $40,000 is required for water main extension on the Glebe.

Saw Mill and Planing Mill News.

NEW WESTMINSTER, B.C.—A local syndicate, said to be representing a company of English capitalists, have acquired a large site near here and intend erecting a saw mill to cost over $500,000 and employ several hundred men. Names of the purchasers are not obtainable.

DALHOUSIE, N.B.—Chappell Bros., of Sydney, N.S., will likely erect large saw and planing mills here. They are asking certain concessions and public opinion is in their favor.

LADNOR, B.C.—The saw mill of the Jervis Inlet Lumber Co. was destroyed by fire recently. Lass, $20,000. It was fully covered by insurance and will be rebuilt.

FREDERICTON, N.B.—H. Holland has added a third boiler to the equipment of the Robinson saw mill at Lower St. Mary's. He also added 84 feet to the mill chimney which was previously 80 feet high.

SOURIS, P.E.I.—B. Creamer's planing mill is burned out.

SUMMERSIDE, P.E.I.—The planing mill of M. F. Schurman & Co., here, was burned out.

WOODSTOCK, N.B.—J. A. Hayden's saw mill has been burned. No insurance. It will be rebuilt.

ST. JOHN, N.B.—P. Mackay has been appointed liquidator for the "Nepisiquit Lumber Co.," manufacturers of lumber and shingles.

NORTH VANCOUVER, B.C.—J. J. McDonald, who has for the past few years managed the Burrard Sash and Door factory, has sold out his interest in the business to Medcalfe & Suiter.

BOISSEVAIN, MAN.—The Rat Portage Lumber Co. have bought the T. Taylor Lumber Co., here, for $20,000 and are now in control.

TORONTO, ONT.—An order winding up the Belding Lumber Co., East Toronto, has been granted by Justice Sutherland. G. T. Clarkson is named interim liquidator, and a reference is directed to the Master in Ordinary. The company's nominal stock is $40,000. The assets are placed at $18,000, and the liabilities at $20,000.

SHERBROOKE, QUE.—C. F. Haseltine is putting in a fine new steam saw mill. He expects to have it in running order in March.

GALT, ONT.—P. W. Gardiner & Son have decided to erect two more additions to their planing mill plant here, one immediately to enlarge the glue room.

PITCOX, ALTA.—Walsh Bros. and Addy have purchased through Stewart Bros., at Penhold, a complete saw mill, planer, etc., and a 32 h.p. traction engine which they have installed nine miles west of here.

LETHBRIDGE, ALTA.—The Western Canada Lumber Co. have opened a yard at Medicin Hat and also at this place. They will erect here a large shed 100 x 60 feet.

VANCOUVER, B.C.—The Koksilah Lumber Co., of Vancouver Island, has been incorporated.

NEW WESTMINSTER, B.C.—R. H. Pogue, of the Royal City Planing Mills, this city, has invented a saw protector, to prevent workmen from injury. It is a metallic hood with a traveling shutter on each side, which drops to the surface of the board irrespective of its size or formation.

REVELSTOKE, B.C.—The Dominion Saw Mills Co. have begun operations on the building of their new office structure here. The building will be two and a half storeys and modern in every respect. It will be steam heated. The company expect to take posession by the end of May.

BEULAH, N.B.—M. Jones and E. Vanwart have purchased the Palmer saw mill at Tennants Cove, and have begun operations.

RAINY RIVER, ONT.—Seventy-five carloads of machinery for the mills of the Shevlin-Clark Co. have been ordered and a crew of men have started to build a spur into the company's property here from the main line of the C.N.R.

General Manufacturing.

VICTORIA, B.C.—The "Ideal Manufacturing Co." is among several extra-provincial companies registered.

WINNIPEG, MAN.—A factory for the manufacture of automobile tire covers and treads will be opened in Winnipeg on April 1 by the Tripie Tread Manufacturing Co.

PRESTON, ONT.—The Canada Buffalo Sled Co. will secure a factory here and manufacture boys' wagons and steerable sleighs. The firm is a combination of the Buffalo Sled Co. and Werlich Bros., of this place.

WINNIPEG, MAN.—The "Western Manufacturing Co." have been incorporated here, with a capital stock of $250,000. They will deal chiefly in lumber, timber, building, construction, etc. C. M. Boyton, R. T. Ferguson, H. Lillie, G. Murray and R. Siderfin, law clerks, all of this place.

ST. JOHN, N.B.—R. M. McCarty, of this city, is promoting a concern which proposes to establish a $500,000 cement industry here. They propose to erect a modern cement manufacturing plant with a capacity of 1,200 barrels per day.

TRENTON, ONT.—The Canadian Button Co., organized recently, will erect a factory here in the early spring. A carload of machinery has already arrived. A. A. Ullyot is general manager. At present the company is working in temporary premises here.

GANANOQUE, ONT.—Work at the Ontario Wheel Co. has been resumed, the new buildings having been completed and the machinery installed.

NEW WESTMINSTER, B.C.—The machinery for a large brickyard at Cloverdale has been assembled and the promoters of the new industry hope to be turning out brick early in April.

PETROLEA, ONT.—The Shuttleworth Co., Tile manufacturers, contemplate a large addition to their plant here.

FREDERICTON, N.B.—The Chestnut Canoe factory here will be greatly enlarged.

LINDSAY, ONT.—It is generally conceded that operations will be re-commenced in the Rider & Kitchener factory here. They will manufacture excelsior exclusively.

MONTREAL, QUE.—The "Cotton Prints Co." have acquired a site and will erect, in the early spring, a cotton converting works for bleaching and printing cotton fabrics. It is understood that the machinery is already ordered or at least its manufacture is being considered. The plant will be furnished with electric power and will be up-to-date in every particular.

MONTREAL, QUE.—The Western Manufacturing Co. are erecting a large factory at the corner of Duluth and Mitcheson St.

WELLAND, ONT.—As reported in last month's issue, the Canadian Automatic Transportation Co. will build a factory here, 150 x 50 feet. Sufficient stock has been sold to make the undertaking a certainty and ground will be broken in early spring.

TILLSONBURG, ONT.—The Canadian Cereal and Milling Co., which bought the Tillson Mills about a year ago, are improving and enlarging their plant. The output at present is about 1,200 barrels a day and about 50 men are employed.

TILLSONBURG, ONT.—The Borden Condenser intends extending its handsome buildings this spring to about twice the present capacity. It is understood that the extension will be about forty feet on the west side of the present factory and sixty feet on the east side.

EDMONTON, ALTA.—The Cardiff Collieries of Morinville are installing a new plant at the mines and increasing the output. They will spend $100,000 on the plant.

MOOSE JAW, SASK.—The Moose Jaw Blacksmith and Carriage Repair Co. is the name of a new local co-operative company recently formed here.

MITCHELL, ONT.—The Hill & Co. bridge works firm have closed a number of contracts for bridges and the outlook for the coming season is bright.

Building Notes.

MONTREAL, QUE.—Holt-Renfrew Co. have purchased a site and will erect a large cold storage plant here. It will be a six or eight storey building equipped with the latest plant and machinery for the cold storage of furs, etc.

MONTREAL, QUE.—Henry Birks & Sons will, shortly, erect an office building 90x130 and several storeys high, on the corner of Union Ave. and Cathcart Street.

MONTREAL, QUE.—The Colonial Real Estate Co. will erect a ten storey sky scraper on St. Catherine St. The building will be of reinforced concrete faced with terra cotta.

MONTREAL, QUE.—The Homoeopathic Hospital on McGill College Avenue will be rebuilt this year at a cost of $100,000.

SASKATOON, SASK.—A. Bowerman is contemplating the erection of a $140,000 business block here. It will be of reinforced concrete, modern in every respect and fireproof.

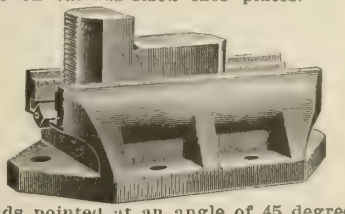
ST. JOHN, N.B.—The C.P.R. is planning to spend more than a million dollars on terminals here.

EDMONTON, ALTA.—The Pembina Coal Co. have set aside $1,000,000 for development purposes on their property near Entwistle.

PRINCE RUPERT, B.C.—The Pacific Coast Construction Co., of Victoria, has secured the contract for the depot of the Marine Department for a sum approximating $200,000.

Face Plate Jaws

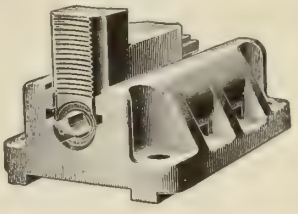
New features include extra large screws, double thrust bearings and special methods of attaching, permitting their use on various-sized face plates.



Ends pointed at an angle of 45 degrees so that four jaws will fit close together at centre. Sizes 4-in. to 14-in.

Boring Mill Jaws

As in the face plate jaws, screws are larger than usual, thrust bearings are double and jaws are wider, heavier and better supported. Made in all steel or with grey iron base as desired.



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Special Reamers

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We have the equipment and the experience. Ask us for prices.

A. B. JARDINE & CO.

HESPELER, ONT.

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PRATT & LETCHWORTH CO.
BRANTFORD ONTARIO

The British Aluminium Co., Limited
LONDON, - ENGLAND
Beg to announce THE OPENING on October fifteenth, 1910, of their new
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MESSRS. PARKE & LEITH, General Agents for Canada
A Large Stock of Aluminium in all the Commercial Forms will be kept—Wholesale and Retail.

Jessop's Best Tool Steel
is yet unexcelled for cutting tools of all kinds, and for general machine-shop use.

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Good, Clean Castings
depend largely upon the facing used. At least, you can't get good castings with poor facings
DIXON'S FOUNDRY FACINGS
help to make the kind of castings that require least cleaning and that are free from hard spots, blow holes, etc. WRITE FOR FREE BOOKLET 223-S.
JOSEPH DIXON CRUCIBLE COMPANY
JERSEY CITY, ... N.J., U.S.A.

Among other operations the work consists of erecting work shops, power house, etc.

MONTREAL, QUE.—The Dominion Express Co. will erect a ten-storey office block on St. James St. It will have a sub-basement given up to the machinery used in running the heating, ventilating and ice-making plants. W. S. Maxwell, of this city, is the architect.

GEORGETOWN.—The Georgetown Coating Paper Mills have erected a large plant which is now in operation. L. E. Fleck is manager.

STRATHCONA, ALTA.—Recent developments indicate that P. Burns & Co. will, no doubt, erect their $1,000,000 packing plant here.

WINNIPEG, MAN.—Gowans-Kent Western, Limited, are building a fine new eight-storey structure here on Market St. Carter-Halls-Aldinger Co., builders, have the contract.

WINNIPEG, MAN.—J. J. Hill announces that he will build a $1,000,000 depot here for his Great Northern, Northern Pacific and Midland Railway.

CALGARY, ALTA.—J. Walker will erect an eight storey business block here this spring. It will have two passenger elevators and plumbing, heating and ventilation of the most modern type. Cost, $175,000.

TORONTO, ONT.—It has been announced here that a big paper mill will be erected at Espanola at a cost of $1,000,000 by the Spanish River Pulp and Paper Co. Work will soon be started and it is planned to get it in operation by Oct. 1. The mill will have a capacity of 100 tons of paper daily, and the pulp will be supplied from the present pulp-making plant, which has a capacity of 125 tons daily. Tenders are now being called for the buildings, and the machinery has been ordered from firms in Canada and the United States. The whole paper plant will be under one roof and the building will be about 525 feet long.

LONDON, ONT.—The C.P.R. will expend about $250,000 here this summer. A station, roundhouse and yards will be built immediately. All the wooden bridges between Toronto and Windsor will be replaced by steel ones.

VANCOUVER, B.C.—Plans are being prepared for an eight-storey business block at the corner of Hastings and Main St. It will be of mill construction.

CALGARY, ALTA.—The C.P.R. will build a $1,000,000 hotel here. Other improvements and extensions here bring the total cost up to $5,000,000.

MONTREAL, QUE.—The Gillette Razor Co. will erect a $100,000 factory on Alexander Street here.

VICTORIA, B.C.—The Dominion Trust Co. will, shortly, erect a six-storey building here at a cost of $135,000.

ESQUIMALT, B.C.—Work will be started at once on the construction of the B.C. Marine Railway Co. drydock here. As it is being built in consideration of the future requirements of the Pacific naval station, it is more than probable that the Pacific Fleet of Canada's Navy will be built here. The local firm is making every effort to secure the contract. It will be 900 ft. by 100 ft. and cost $3,000,000.

SASKATOON, SASK.—J. P. O'Leary, of the Montreal firm of Brown and Vallance, architects, has announced the letting of the contract for the huge 6-storey hotel here to the firm of Carter-Halls-Aldinger Co. The material used in the construction will be terra-cotta and Menominee brick. The structure will have a highly ornamental front and will have both freight and passenger elevators. Cost, $300,000.

WINNIPEG, MAN.—Provincial Architect Hooper is preparing plans for new government buildings to cost approximately $3,000,000. This includes the new Asylum at Brandon, a new agricultural college and new legislative buildings.

TORONTO, ONT.—The C.P.R. are extending their freight and passenger facilities within the city at a cost approximately $7,000,000. The plans include a new passenger depot and freight yard at North Toronto, freight sheds and yards at Christie Street, George Street, Queen's Wharf, Parkdale and West Toronto, with a freight delivery yard at the corner of Bloor and Dundas Streets. There will also be a new office building of several storeys at the corner of King and Yonge Streets, plans of which are not yet complete.

COLLINGWOOD, ONT.—The Northern Navigation Co. will place an order for another passenger and freight steamer to cost about $600,000. The plans will be prepared, tenders asked for from Canadian yards, and the contract awarded in sufficient time to permit of the laying of the keel in July or August next.

VANCOUVER, B.C.—F. D. Boucher will erect an eleven-storey apartment house here at a cost of $300,000.

ST. JOHN, N.B.—Scovill Bros., Limited, intend erecting a modern five-storey building here. A passenger elevator will be installed.

EDMONTON, ALTA.—R. Tegler is calling tenders for a six-storey $100,000 building here.

SASKATOON—A representative of the J. I. Case Co., of Racine, Wis., is here to purchase a site for a warehouse. The building will be one storey high, and 400 feet by 250 feet.

VANCOUVER, B.C.—"Lester Court" is the name of a palatial building to be erected here at a cost of $100,000. It will be of first-class construction, and fireproof steel frame reinforced concrete. It will be lighted with electricity. This is the first of a series of buildings to be erected by A. J. Paterson Co.

BRANDON, MAN.—The provincial government will erect a $50,000 normal school here on Tenth Street. A manual training department is included.

GUELPH, ONT.—The new cold storage and packing plant erected by Chas. W. Barber will be in operation in a short time. It is of stone, concrete and wood. The building is 28 x 98.

STRATHCONA, ALTA.—P. Burns & Co. will erect a new million and a half dollar packing plant here. The big firm has acquired an additional 27 acres adjoining its present site.

EDMONTON, ALTA.—The G.T.P. will construct two tunnels and 24 bridges on the branch line south of Edson, to serve the immense coal areas in the Brazean country.

MONTREAL, QUE.—The C.P.R. has been granted a permit to erect freight sheds on Lacroix Street to cost from $66,000 to $100,000.

PRINCE ALBERT, SASK.—The Modern Automobile Co. will erect here, in the spring, a fireproof brick garage, 50 x 130 feet. It will be one of the most up-to-date garages in Western Canada. Repairs of all kinds will be undertaken.

FORT WILLIAM, ONT.—The Swift Canadian Co. will erect a 4-storey cold storage plant here this summer at a cost of $75,000.

TRADE NOTES.

HAMILTON—The Hamilton Machinery Co. will handle the entire output of the American Road Machinery Co., Goderich; the Canadian sales end of the Keystone Smooth Bottom Corrugated Steel Sewer Pipe Co.; Interstate Automobile Co., Muncil, Indiana. They will handle concrete machinery, wire fence, reinforced concrete wire, mining machinery, etc. They will open branch offices in all the large Canadian centres.

MONTREAL—The Simonds Saw Co., who have a branch factory here for the manufacture of hack saws, etc., have constructed a new steel mill at Lockport, N.Y., the first steel being rolled on January 2.

MONTREAL—The Harbor Commission have installed a new Schumacher & Boye 20-in. instantaneous gear machine lathe in their works here. This machine was purchased from Foss & Fuller.

MONTREAL—Jos. Lacroix, patternmaker, 72 Wellington Street, Montreal, has started work on the construction of his new shop at 143 Wellington Street and will move into his new quarters about May 1st.

The Smart-Turner Machine Co., 191 Barton St., Hamilton, report the following recent orders for their pumps: Canadian Axminster Carpet Co., Hamilton; Rainy River Lumber Co.; Canada Screw Co., Hamilton; Lever Bros., Toronto; G. T. R., Allandale; Gunns Ltd., Toronto; Great Lakes Dredging Co., Port Arthur; Steel Co. of Canada, Hamilton; and Otis Fensom Elevator Co., Hamilton. These pumps include several types designed by the Smart-Turner Machine Co.

MONTREAL.—Ernest Muller, of Schuchardt & Schutte, New York, paid a visit to their Canadian headquarters here, recently.

WELLAND.—The Quality Beds, Limited, have installed a No. 28 Collian Cupola manufactured by Frederic B. Stevens, Detroit.

Gillette Company to Build.

The Gillette Razor Co. have purchased a lot of land on the corner of Dowd & Alexander Streets, Montreal, 100 feet frontage on St. Alexander and 76 on Dowd. They will build here a five-storey fireproof building of mushroom construction. Work will be commenced on the 1st of May next, and will be rushed through as soon as possible.

Foss & Fuller, Montreal.

In a recent issue of Canadian Machinery reference was made to Foss & Fuller, Montreal, a new machinery agency. This firm is now dissolved, Geo. F. Foss continuing the business under the name of Foss & Fuller. Their offices and warehouse at 329 St. James St. are being enlarged to take care of their business which is increasing.

Winnipeg Industrial Campaign.

Secretary Roland of the Winnipeg Industrial Bureau and Controller Waugh of the city government, started on an industrial inquiry trip early in the month. Advices received from them indicate great interest in Western Canada among manufacturers in the United States and give assurance that Winnipeg will soon receive great accessions to her industrial growth. Among the industries which will soon be established in Winnipeg is a process for making textiles from flax straw, which is produced so largely in the West and which now is wasted by burning.

International Harvester Company.

Many improvements have been made at the Hamilton works of this company. These improvements add to the capacity of practically every department at this works, and consist of a paint shop building, 72 x 95 ft., four-storey and basement, of mill construction, and an addition to the gray iron foundry building, 82 x 200 ft., of brick and steel construction; a new mill room building, 142 x 150 ft., two storeys and basement, of brick and mill construction; an extension to the wood shop building, 81 x 100 ft., and a new manufacturing building, 72 x 305 ft., four storeys and basement, of mill construction. A new warehouse in two sections, respectively, 64 x 119 ft. and 100 x 119 ft., four-storey and basement, of brick and mill construction, and a new office building, two storeys and basement, 60 x 103 ft., have also been constructed.

Oliver Chilled Plow Works.

The Oliver Chilled Plow Works have called for tenders on an assembling building, three storeys and basement, 90 x 406 feet, of steel and reinforced concrete, the cost of which is estimated at about $200,000, as provided for in the original plans. This will shortly be followed by the erection of the malleable and gray iron foundry, 135 x 576 feet, one storey, and plans will be prepared for the other buildings as rapidly as possible. The forge and machine shop is already in operation, and the power house will be finished by the middle of the month.

Windsor's New Industries.

Windsor has secured two important industries, the Canadian branch of the Maloney Electric Co., St. Louis, and the plant of the Canadian Winkley Co., a branch of a Detroit concern. The Maloney Co. which manufactures electrical machines, will build a $10,000 plant in the city's factory district at once, while the Winkley Co., manufacturing brass goods, has bought a site in the west end of the city, and will erect a $10,000 plant this year. The by-laws granted exemptions to the two companies.

Coke Ovens of Soo Corporation.

The by-product coke oven plant which H. Koppers, Joliette, Ill., has been building for the Lake Superior Corporation, at Sault Ste. Marie, Ont., is completed. No. 1 battery of 55 ovens is now ready and will soon be producing coke. The brick work on No. 2 battery of 55 ovens is all completed and will be ready to produce coke in a month.

Goldschmidt Thermit Co. Calendar.

The 1911 calendar recently issued by the Goldshmidt Thermit Co., 90 West Street, New York, contains a useful map of North and Central America. Several repairs are illustrated and the application of thermit to marine, foundry and railroad uses, is given. The folder is 20 x 38 inches. The Canadian agency is 109 Richmond St. West, Toronto.

New Tube Works at Montreal.

The construction of the Canadian Tube & Iron Co.'s works is progressing very favorably. The buildings consist entirely of steel and reinforced concrete, making them entirely fireproof and no expense is being spared in the purchase of modern machinery and equipment to enable the company to manufacture at the lowest possible cost. The capitalization of the company is $1,000,000, all common stock, which has been subscribed for privately. The officers of the company are as follows: J. W. McConnell, president; James L. Waldie, vice-president and managing director; Albert H. Hough, sales manager and director; William Mosley,, works manager and director; Herbert Worrall, secretary-treasurer. Directors:—Wm. Molson Macpherson, Dr. Milton L. Hersey, H. A. Lovett, K.C.

The buildings are now nearing completion, and it is expected that the company will start manufacturing early in the spring. The works are situated on a large tract of land which has been obtained by the company at Cote St. Paul, Montreal.

Canadian General Electric Enlarging.

The Canadian General Electric are planning to erect a large lamp factory and new offices in Peterboro'. The lamp factory will be 60 x 125 ft. and will cost $250,000.

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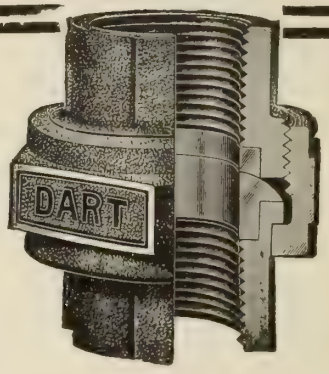
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DOMINION BELTING CO. LTD.
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simply cannot leak. They are made in two bronze-seated sections which meet in a ball joint that can be made with almost incredible speed whether pipes are in or out of alignment. They are impervious to corrosion or any other form of decay. Made in the Screwed Type for pipes up to 2½ inches and in the Flange Type for pipe 2½ inches and larger.



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DIES AND TOOLS
POWER PRESSES

For Rapid Production of
Sheet Metal Stampings

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TORONTO, ONT.

CATALOGUES.

Calendar.—The city of Winnipeg has sent out a large calendar featuring that place as the hub of industry, to which all roads lead. It was very cleverly arranged, and contains a handy index of information, relative to Winnipeg, aptly termed, "an open book of opportunity."

Friction Clutches.—The Dodge Mfg. Co. have issued a 16-page catalogue describing Dodge split and solid clutches. The economic features are dealt with and the construction of the clutch is given in detail. A two-page table shows the sizes manufactured together with full information in regard to h.p. transmitted, speed, face of pulley, cost, etc.

Chain Drive.—Jones & Glassco, Montreal, have published an interesting folder giving approximate comparative costs of electric power using belt and chain drive. In a list of Canadian towns given, the saving per useful horse-power per year by using chain instead of belt varies all the way from $2.42 in Toronto up to $12.38 in Calgary. In this comparison it is pointed out that the calculations are based on the maximum efficiency (80 per cent.) of belt drive but the minimum efficiency (95 per cent.) of chain drive.

Milling Machines.—The Garvin Machine Co., Spring and Varick streets, New York City. Circular No. 142 contains a description of the Nos. 14 and 15 vertical spindle milling machines for machining castings which require the finishing of surface joints. No. 143 refers to the use of the No. 3 duplex milling machine, one of the special advantages of which is the finishing of two sides of the work perfectly parallel at the same time.

Electric Welders.—A handsome calendar of 35 pages on coated paper, size 6 x 9 inches, from the Toledo Electric Welder Co., Cincinnati, describes their various types of electric welding machines. One of these welders is shown embossed on the front cover, making a very attractive cover design. Several pages are devoted to "Electric Welding Machines—What they can do and how they do it." The last few pages are devoted to valuable data for use in connection with welding machines and shop practice.

Book Review.

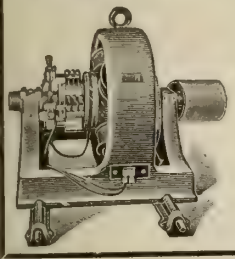
"The Effect of Keyways on the Strength of Shafts," by Herbert F. Moore, has just been issued as Bulletin No. 42 of the Engineering Experiment Station of the University of Illinois. This bulletin records the results of tests made to determine the relative strength of solid shafts and shafts with keyways. Various sizes of shafts were tested and for each size of shaft the weakening effect of keyways of several proportions was determined. Tests were made on shafts subjected to twisting only and on shafts subjected to twisting and bending at the same time. The results show that the weakening effect of keyways of the usual proportions upon the strength of shafts is considerable, a square keyway of the usual size causing a reduction of about one-sixth in the strength of the shaft. Formulas and a diagram are given for determining the effect of keyways of various proportions. The effect of keyways for the Woodruff system of keying is discussed. The results of the tests are summarized in a table showing the power which can be transmitted by various sizes of shafts with keyways of usual proportions. Copies of Bulletin No. 42 may be obtained gratis upon application to W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Illinois.

The Mechanical World Pocket Diary and Year Book for 1911.—Twenty-fourth year of publication. Size, 4x6 in.; pages, 423. Bound in cloth. Price, twelve cents, net. Published by Emmott & Co., 65 King Street, Manchester, England.

In presenting this yearly revised engineers' pocket-book, some 32 pages have been added, and by carefully revising and condensing, space has been provided for the introduction of a large amount of new matter. Among the special features of this edition are a lengthy section on the shapes, speeds and feeds of cutting tools with supplementary sections dealing with milling cutters and twist drills. The section on standard screw threads is entirely new, and that dealing with screw cutting has been extended considerably. Other new sections deal with high speed steel and the constructive details of gas engines. Several additions have been made to the tables of weights, measures, etc., and a new table of steam fittings and tables and data on marine boilers, rivetted joints, etc., are included.

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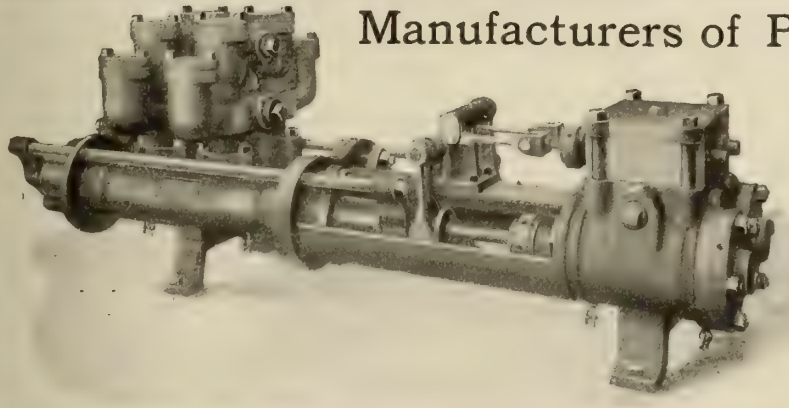
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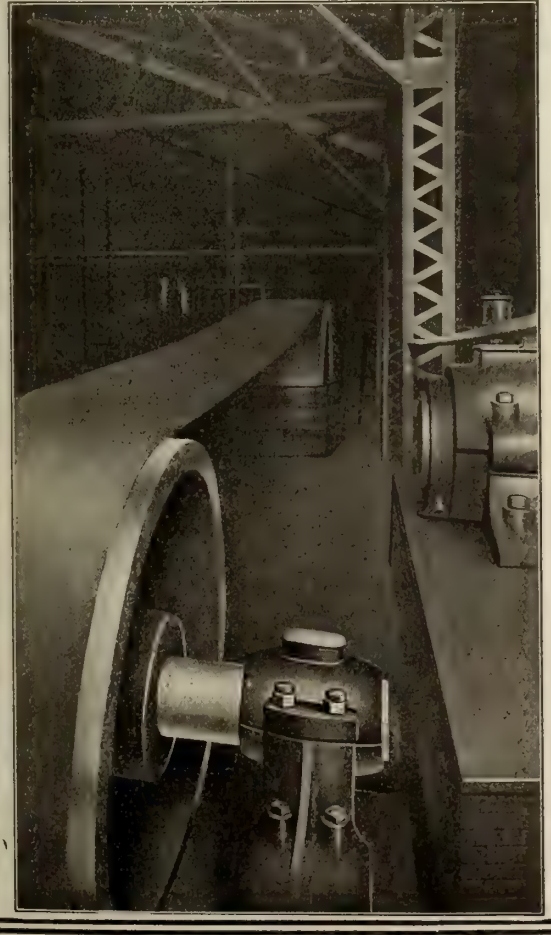


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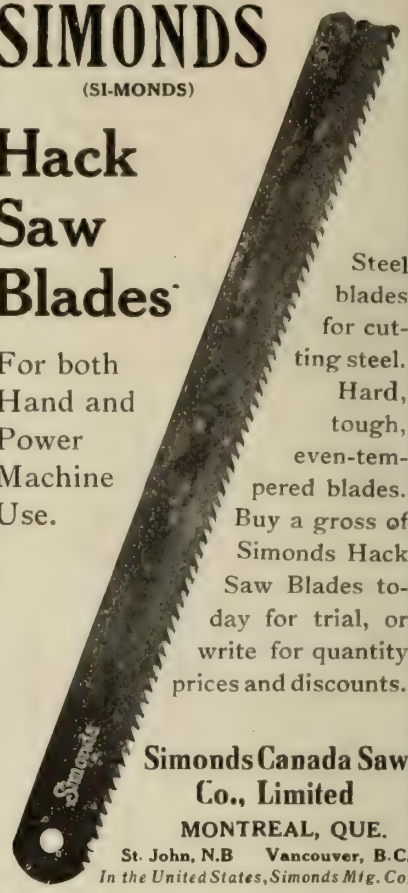
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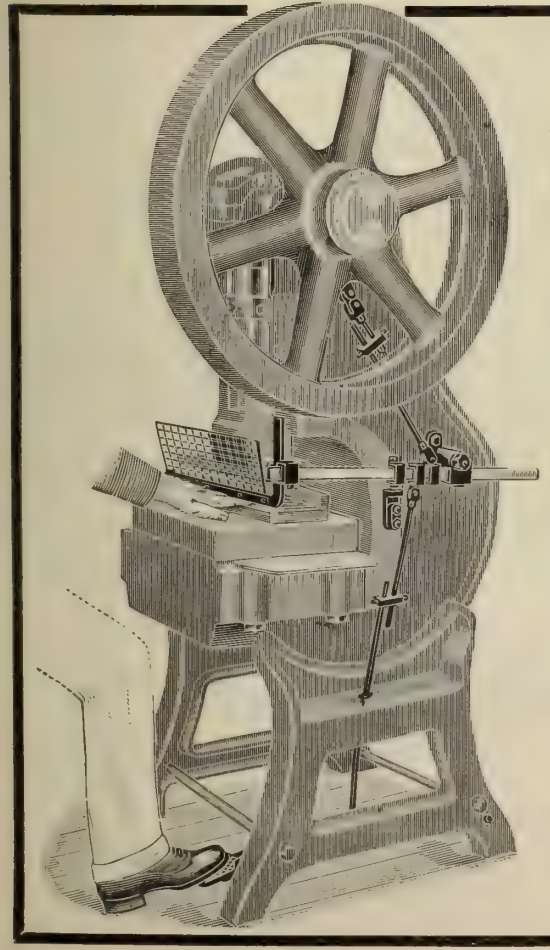
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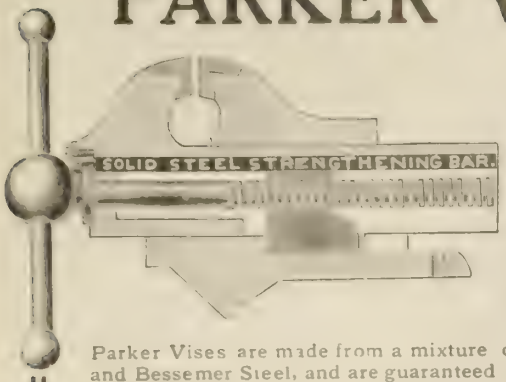
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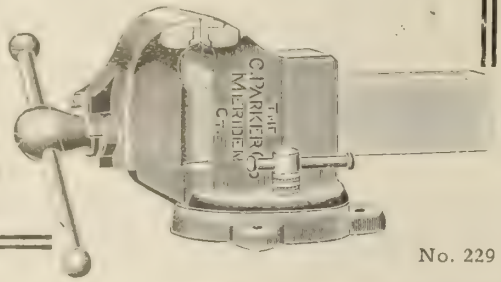
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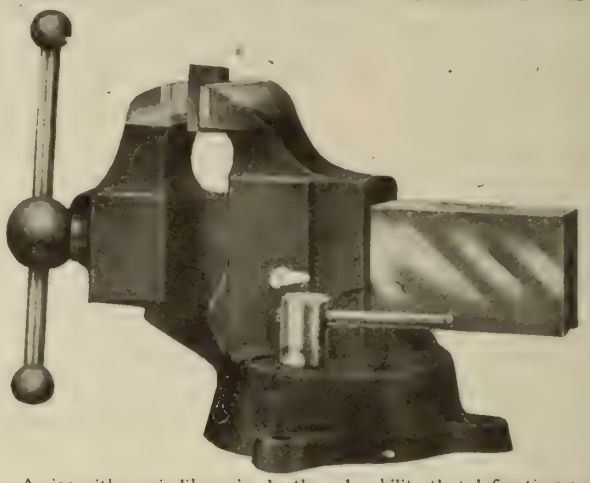
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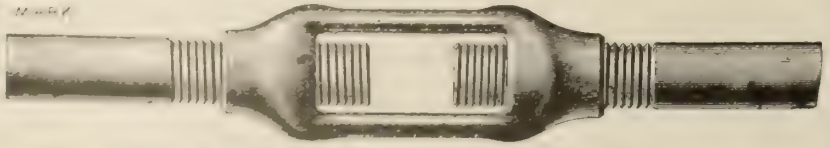
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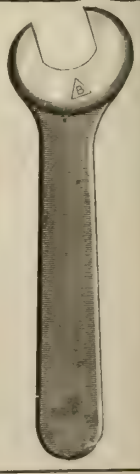
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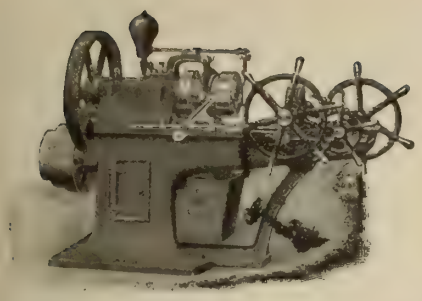


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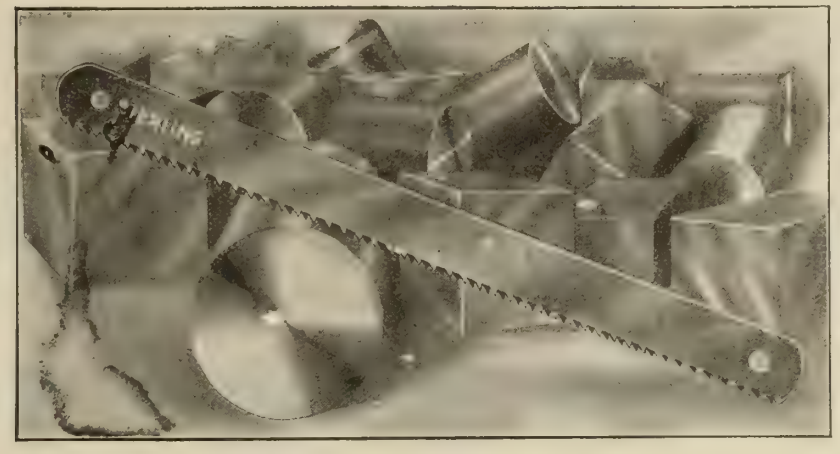
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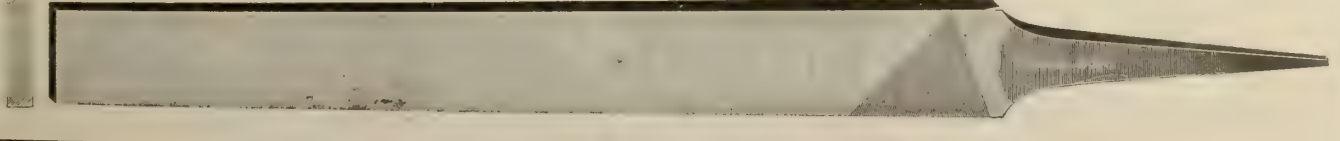
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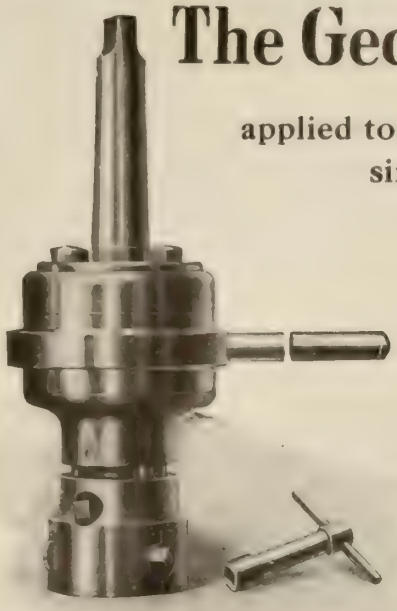
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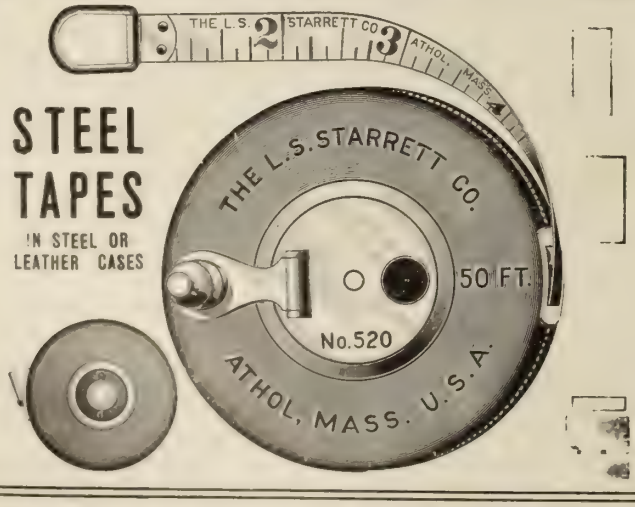
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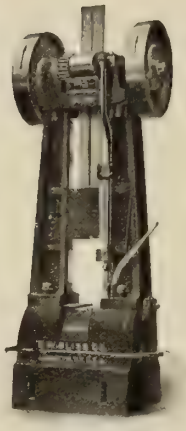
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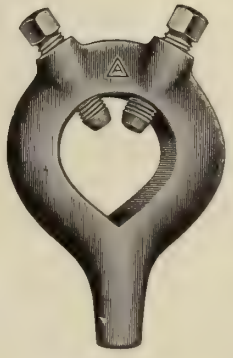
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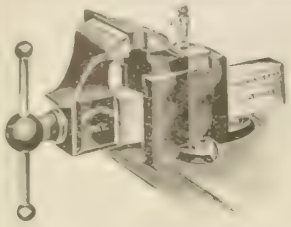
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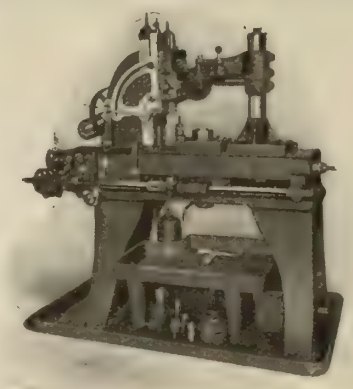
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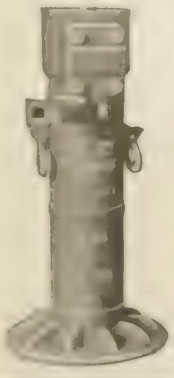
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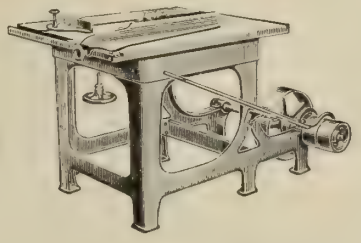
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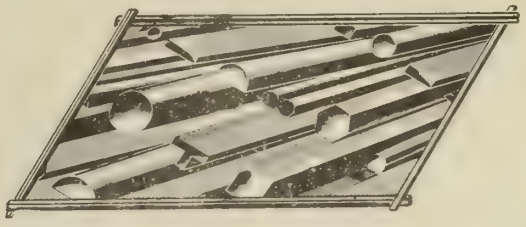
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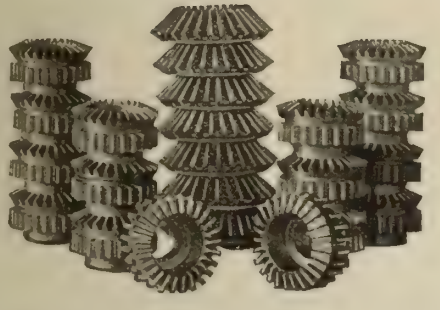
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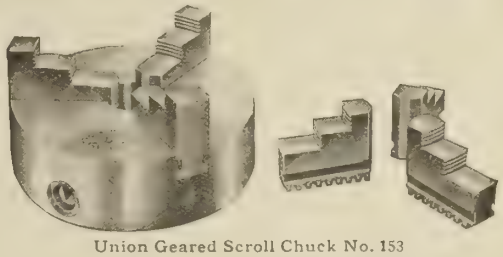
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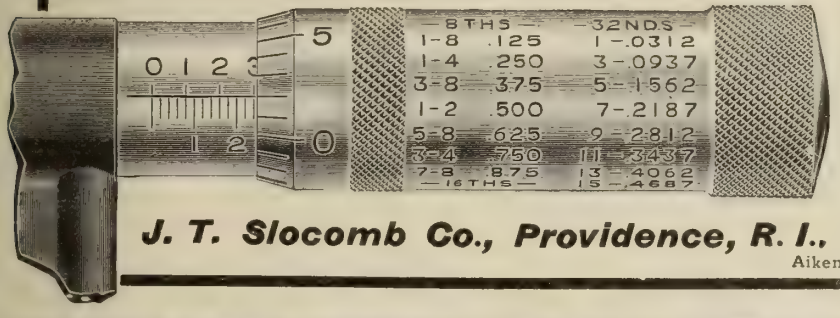
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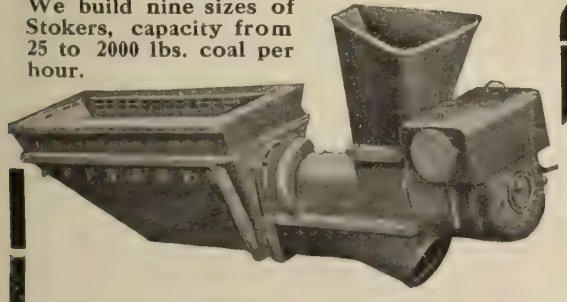
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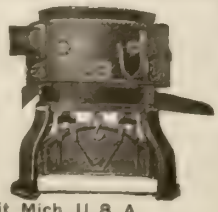
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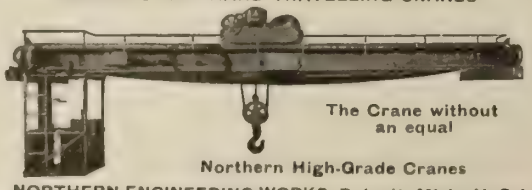
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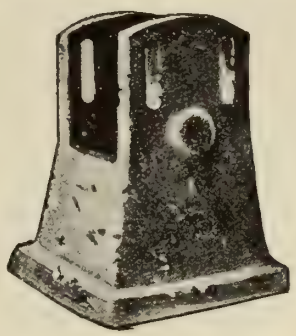
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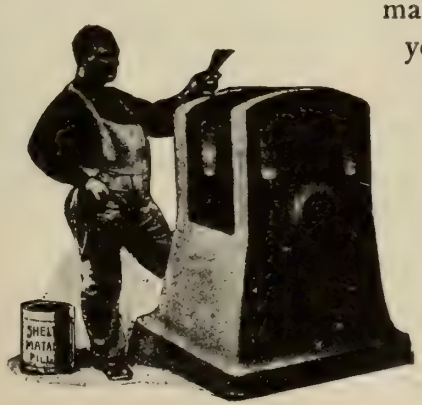
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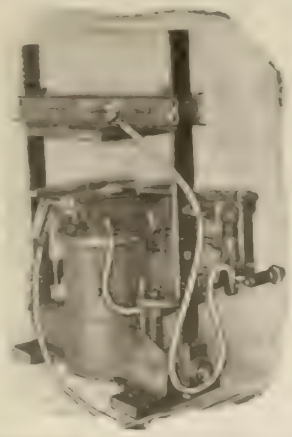


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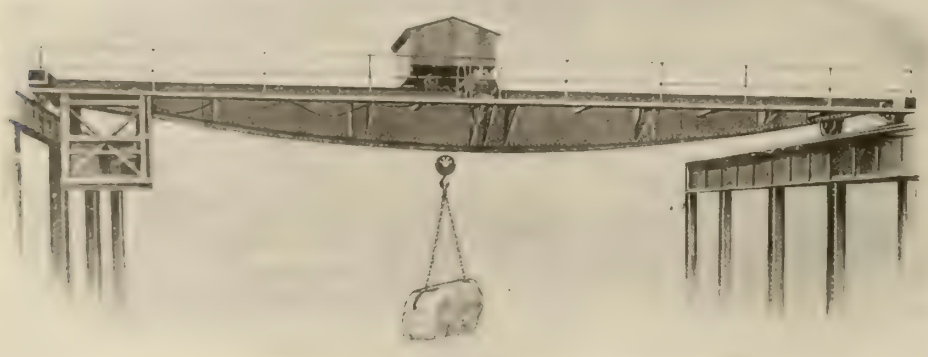


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One hour a day is ample time to enable you to earn this salary.

Competent representatives will be given charge of our entire business in their respective towns—securing renewal orders, also new business.

This work is pleasant and does not require experience.

No matter what size your town may be there is plenty of opportunity for a circulation representative of The MacLean Publishing Company, to earn five dollars every week, in addition to his present salary.

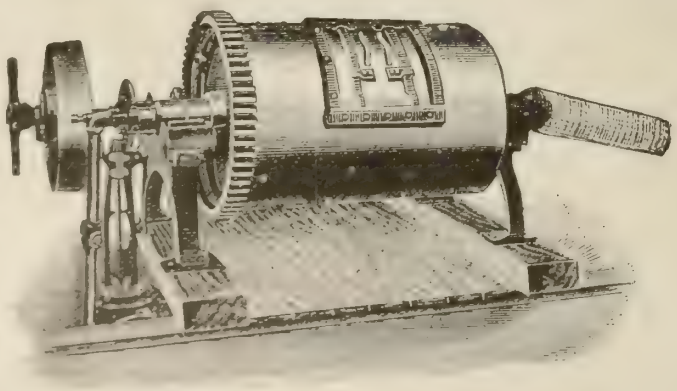
Write at once for particulars.

MacLean Publishing Company

143-149 University Avenue : : : : Toronto, Ontario

A GOLD MINE

SAVE YOUR IRON



SLY'S PATENT IRON CINDER MILL

Patented, No. 514097. Patented, No. 841728.

may be at your disposal on your very premises. Look out of your side window or back door and see if you have not an accumulation of cupola dump, and other foundry refuse, which is a total loss to you in its present state. Why not add to your profits and install one of the Sly Patent Cinder Mills to reclaim this iron and be astonished at your former loss and pocket the rich returns from your newly-discovered mine.

Sly's Patent Iron Cinder Mill will save 95% of the coke contained in your cupola dump, and gangway scrapings. Iron is valuable, then why throw it in the dump? Iron recovered by this Mill is better than machinery scrap. Study economy in a foundry and your profits will increase accordingly. Mill will pay for itself three or four times every year, and we have records of Mill paying for itself twelve times a year. Let us know amount of your daily melt and we will quote. *Write for Cinder Mill Catalogue F.*

We also manufacture Cleaning Mills, Dust Arresters, Sand Blast and Foundry Equipment.

THE W. W. SLY MFG. CO., CLEVELAND, O.

The advertiser would like to know where you saw his advertisement—tell him.


GLUTRIN

The cost of cleaning can make a difference in your profits.

Glutrin makes cores that clean easily.

Robeson Process Company

Grand Mere, P.Q.

Selling Agents:

FRANCIS HYDE & COMPANY

31 Wellington Street

MONTREAL, CANADA

Increased Efficiency

Means Increased Profits

If you wish your profits to be what they should be, you should have the most modern and efficient equipment in your foundry and machine shop. The most modern way to handle castings and all heavy machinery is by our

Cyclone Hoists

HIGH SPEED

EFFIC ENCY=80%.—The hoists will raise two tons one foot, with 125 pounds pull, overhauling only 39½ feet hand chain. AUTOMATIC BRAKE immediately locks when hand chain is released.

Acme Parting

Our Acme Parting is used in some of the largest foundries in Canada. It insures smooth, clean, accurate work

WRITE FOR CATALOGUE.

Ontario Wind Engine & Pump Co., Limited

WINNIPEG TORONTO CALGARY

Foundry Supply Dept.

FIRE BRICK

AMERICAN and SCOTCH



CUPOLA BLOCKS and all other SPECIAL SHAPES

For Foundries, Blast Furnaces, Rolling Mills, Steel Plants, Cement and Lime Kilns, Glass Plants, Boiler Settings, etc.

IMMEDIATE SHIPMENTS

from our stock in Toronto, or direct from Works.

The Ontario Lime Association

LIMITED

118 Esplanade East, - TORONTO



Often Imitated! Never Equalled!

Tallman's Reputation is in the Goods.

MANUFACTURERS OF

Finished Brass Goods

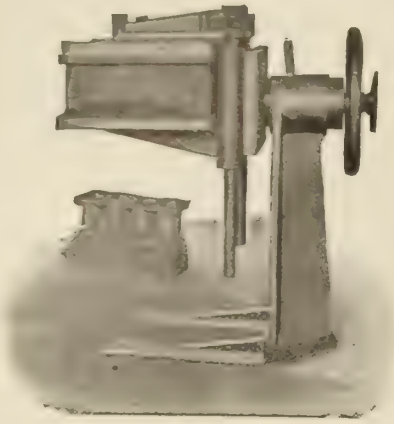
Brass Castings

Aluminum Castings

Tallman Brass & Metal Co.

HAMILTON, ONT.

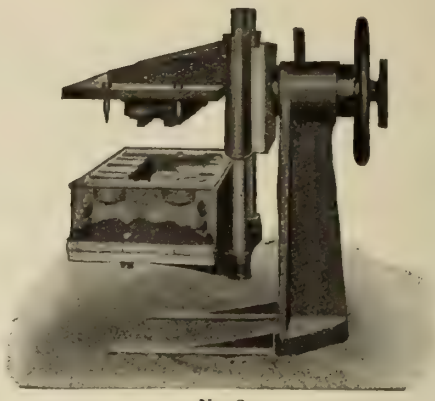
Grimes Roll-Over Molding Machine



No. 1

This is a simple, standard machine, requiring small floor space.

It is perfectly balanced, requiring no counter-balancing mechanism, as centre of gravity is centre of rotation.



No. 2

By means of small hand wheel shown in cut, one man can turn largest flask smoothly and without jerk.

Pattern is drawn by absolutely straight gravity drop.

This machine is adjustable for deep flasks and can readily take care of flask 24 in. x 36 in. and 4 to 12 in. in depth, with maximum pattern draft of 12 in.

Positive adjustable pins at four corners of clamping device, Fig 2, compensate for unevenness of floor boards.

PRICE, f.o.b. cars Windsor, $125.00

HIGH GRADE CASTINGS are not made with low grade materials. Think this over when you see a poorly finished casting in your cleaning room, and remember, if you please, if you wish to place the pattern in the high grade class, our No. 48 Plumbago will do it, also that the saving in cleaning room expense would pay for three times the necessary No. 48 Plumbago to have made it high grade.

Another vital point is that you have a core wash which will peel clean and not run before the metal. Try our Eureka Blacking, the best core wash on the market.

The Detroit Foundry Supply Company

PLATERS' AND POLISHERS' SUPPLIES

FACING
FIRE BRICK
FOUNDRY SUPPLIES
FOUNDRY EQUIPMENT

DETROIT, MICH.
WINDSOR, ONT.

We are exclusive selling agents for Homogen

If you wish a light colored parting equal to Lycopodium, Try our Eureka Parting.

The advertiser would like to know where you saw his advertisement—tell him.

THE SELECTION OF FIRE BRICKS

Sole manufacturers of KING Fuel Oil Furnaces for all heating and melting purposes

Fire Bricks are a necessary item of expense and, as such, should be given careful consideration. This expense is only kept on a minimum basis by using the most suitable fire brick to meet the exact conditions of service.

The purchase price of Fire Bricks does not indicate their cost.

It is the life of the Fire Brick which demonstrates whether you are getting full value for the money invested.

In addition to being required to withstand heat, Fire Bricks are frequently subjected to one or more of the following conditions:

1st. Chemical action of powerful fluxes and slags.

2nd. Reducing action of gases.

3rd. Sudden heating and cooling with wide temperature variations.

4th. Pressure and grinding action.

5th. Abrasion.

6th. Cutting and impinging flame.

7th. Combination of one or more of the above with heat.

No matter what your needs are, we have a brick which will give you satisfaction.

Our technical department is ready at all times to offer suggestions which will eliminate your fire brick troubles.

Protect yourself against tedious delays and costly experiments by buying your fire bricks from us—who know this business from A to Z.

The best known brands on the market to-day are our WOODLAND, H.W. SPECIAL, MUNRO, BONNYBRIDGE, KIRKWOOD.

FRANCIS HYDE & COMPANY

Manufacturers of Foundry Equipment and Supplies

31 Wellington Street - MONTREAL, QUE.

CONQUEROR

HIGH-SPEED TOOL STEEL

is now rolled in Special Profile Sections
GREAT SAVING IN WEIGHT

CONQUEROR IMPROVED
HIGH-SPEED **DRILLS**

made by twisting the rolled bar.
NO EXPENSIVE MILLING. NO WASTE of COSTLY MATERIAL
The natural fibre of the Steel remains undisturbed.

RESULT—
BETTER DRILLS, LESS BREAKAGES, LOWER PRICES



Write for Particulars to-day

A feature of these Drills is that no special holder is required. Shanks made to fit ordinary Morse Sockets

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J. Beardshaw & Son, Ltd.
Sheffield, Eng.

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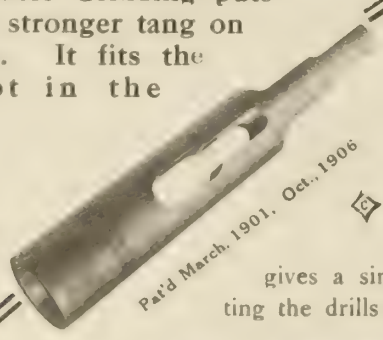
"MORSE" REAMERS

are tools of Precision. They will do your work right, being scientifically made to meet modern requirements successfully.

Send for a "MORSE" Catalog, Illustrated, over 350 pages, free.

Morse Twist Drill & Machine Co.
New Bedford - Mass. - U.S.A.

Three Minutes' Grinding puts a new and stronger tang on the shank. It fits the lower slot in the socket.



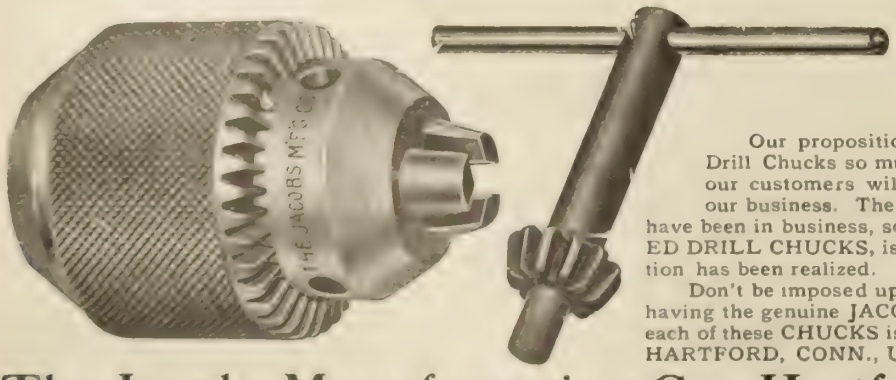
What Do Your Twisted-Off Tangs Cost?

Keep account for a time of the new drills used to replace those thrown into the scrap heap because of twisted-off tangs, and you will see. These scrapped drills are all right in every other respect.

The "PERFECT" Double-Tang Socket

gives a simple, effective, and inexpensive means of eliminating this cost and putting the drills back in money-earning shape. **Write for Folder A.**

The CLEVELAND Twist Drill Co. CLEVELAND Chicago New York



Quality

Our proposition on Drill Chucks is to make superior Drill Chucks so much better than anyone else makes, that our customers will do all the talking necessary to increase our business. The fact that we have, in the seven years we have been in business, sold more than 90,000 JACOB IMPROVED DRILL CHUCKS, is the most positive proof that our aspiration has been realized.

Don't be imposed upon with inferior imitations. Insist upon having the genuine JACOBS IMPROVED DRILL CHUCKS. On each of these CHUCKS is printed: "THE JACOBS MFG. CO.,—HARTFORD, CONN., U.S.A.—PATENTED SEPT. 16, 1902."

The Jacobs Manufacturing Co., Hartford, Conn., U.S.A.

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To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

To Our Advertisers—Send in your name for insertion under the heading of the lines you make or sell.

To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

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Matthews & Yates, Manchester, Eng.

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Holden Co. Montreal

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Lumen Bearing Co., Toronto.
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Galt Malleable Iron Co., Galt
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Smiths Falls Malleable Castings Co., Smiths Falls

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Shelton Metallic Filler Co., Derby, Conn

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The Smart-Turner Machine Co., Hamilton
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Montreal Steel Works, Montreal

Crushers, Rock or Ore.

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Cutter Grinders.

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Pratt & Whitney Co., Hartford, Conn.
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Drills, Blacksmith.

Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford

Drills, Centre.

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Cumming, J. W., New Glasgow, N.S.

Drills, Electric.

Holden Co., Montreal
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Niles-Bement-Pond Co., New York.
United States Electrical Tool Co., Cincinnati

Drills, High Speed.

Wm. Abbott, Montreal
Hermann Boker & Co., Montreal
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb, Montreal.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Oil Tube.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Drills, Pneumatic.

John F. Allen Co., New York
Canadian Rand Co., Montreal
Holden Co., Montreal
Inuependent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Portable Electric.

Holden Co., Montreal
United States Electrical Tool Co., Cincinnati.

Drills, Ratchet.

Armstrong Bros. Tool Co., Chicago.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co. Cleveland
A. B. Jardine & Co., Hespeler
The Keystone Mfg. Co., Buffalo, N.Y.
Morse Twist Drill and Machine Co., New Bedford
Chas. Parker & Co., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.

Drills, Rock.

Canadian Rand Co., Montreal.
Holden Co., Montreal

Drills, Track.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Drills, Twist.

The Canadian Fairbanks Co., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Morse Twist Drill and Machine Co. New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.

Drill Sockets.

Morse Twist Drill and Machine Co., New Bedford

Dry Kiln Cars.

Sheldons Limited, Galt

Dry Kiln Equipment.

Sheldons Limited, Galt

Dump Cars.

Rupert G. Bruce Co., Ltd., Toronto
Browning Engineering Co., Cleveland
The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co. Montreal
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dynamos.

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Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

Electrical Supplies.

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Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Electric Welding

Standard Welding Co., Cleveland, O.

Elevators.

Francis Hyde & Co., Montreal.
Waterous Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill.

Elevator Buckets.

Waterous Engine Works Co., Brantford.

Emery and Emery Wheels.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton.
Garvin Machine Co., New York
Francis Hyde & Co., Montreal
Stevens, F. B., Detroit, Mich.

Emery Stands.

Rupert G. Bruce Co., Ltd., Toronto
Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.

Emery Wheel Dressers.

Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Gardner, Robt. & Son Montreal
Francis Hyde & Co., Montreal.

Engineers, Marine and Mechanical.

Canadian General & Shoe Machinery Co. Levis, Que.

Engines, Marine.

John Inglis Co., Ltd., Toronto
The "Swift" Motor Car Co. of Canada Ltd., Chatham

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Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.

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Canadian Yeates Gordon Co., Hamilton
Fielding & Platt Ltd., Gloucester, Eng.
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco Montreal
The "Swift" Motor Car Co. of Canada, Ltd., Chatham

Engines, Steam.

Canadian Yeates Gordon Co., Hamilton
The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst N.S.
Scotia Eng. Co., Montreal
Sheldons Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Equipment, Shop.

Garvin Machine Co., New York

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Parmenter & Bulloch Co. Gananoque

Exhaust Heads.

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Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.

Canadian Westinghouse Co., Hamilton
Matthews & Yates, Manchester Eng.
Sheldons Limited Galt, Ont.
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.

The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
Robb Engineering Co., Amherst N.S.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford.

Files.

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Simonds Mfg. Co., Fitchburg, Mass.

Flanges.

Dart Union Co., Ltd., Toronto

Forges.

Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.
Independent Pneumatic Tool Co. Chicago, Ill.
W. S. Rockwell Co., New York
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.

Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York

Forgings, Automobile.

Canadian Billings & Spencer, Ltd., Welland.

Forgings, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.

Forgings, Locomotive.

Canadian Billings & Spencer, Ltd., Welland.

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London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co., Toronto

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Friction Clutch Pulleys, etc

The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs

Montreal Steel Works, Montreal

THE

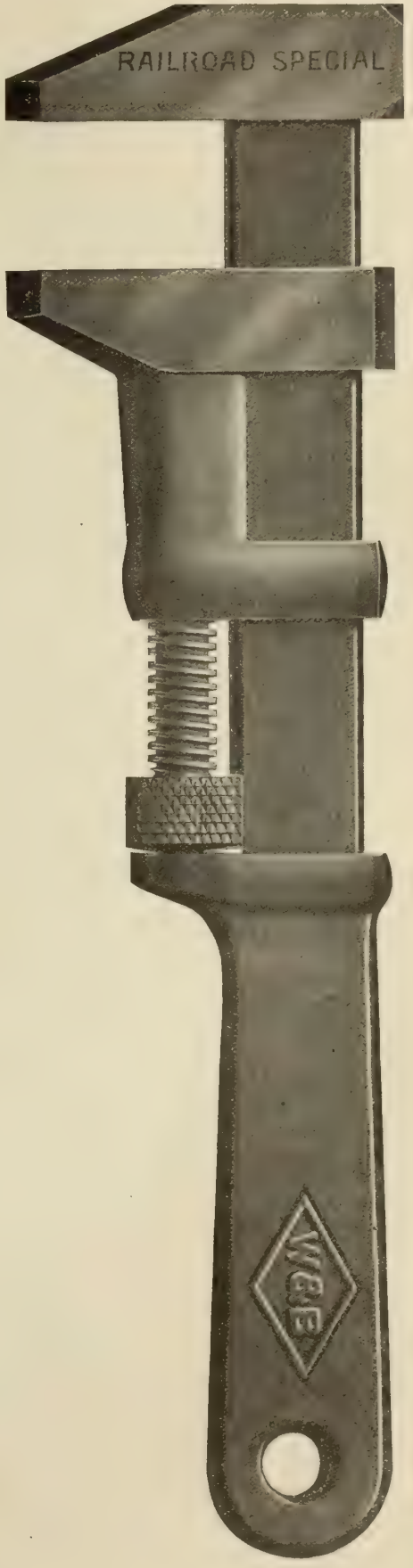
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Hamilton Machine Tool Co. Hamilton
Morse Twist Drill and Machine Co. New Bedford
Niles-Bement-Pond Co. New York
Pratt & Whitney Co. Hartford, Conn
Schuchardt & Schutte, New York

Gears, Angle.

Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont
Waterous Engine Co., Brantford

Gears, Cut.

Armstrong Bros., Toronto
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont
John Millen & Son, Montreal
New Process Raw Hide Co., Syracuse

Gears, Mortise.

Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont
John Millen & Son, Montreal
New Process Raw Hide Co., Syracuse
Waterous Engine Works Co. Brantford

Gears, Rawhide.

Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont
John Millen & Son, Montreal
New Process Raw-Hide Co., Syracuse
Waterous Engine Works Co., Brantford

Gears, Reverse.

The Carrie Johnson Machine Co., Manchester, Conn.

Gears, Worm.

Gardner, Robt. & Son, Montreal
John Millen & Son, Montreal

Generators, Electric.

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Canadian Westinghouse Co., Hamilton
Hall Engineering Works, Montreal
Lancashire Dynamo and Motor Co., Ltd., Toronto
Toronto & Hamilton Electric Co., Hamilton

Grates, Shaking and Dumping

Standard Engineering Co., Toronto

Graphite.

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[illegible] Co., Jersey City
[illegible] Supply Co., Windsor
[illegible] Hyde & Co., Montreal
John Millen & Son, Montreal
[illegible] E. E. Detroit, Mich.

Grease Cups.

[illegible] Mfg. Co., Peterboro

Grinders, Automatic Knife.

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W. H. Banfield & Sons, Toronto
Waterous Engine Works Co., Brantford

Grinders, Bench.

Canadian Hart Wheels Ltd., Hamilton
Morse Twist Drill and Machine Co., New Bedford

Grinders, Bench, Electric.

[illegible] Supply Co., Cincinnati

Grinders, Centre.

Canadian Hart Wheels Ltd., Hamilton
Niles-Bement-Pond Co., New York
United States Elec. Tool Co., Cincinnati

Grinders, Cutter.

[illegible] Co., Worcester, Mass.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

Grinders, Disc.

Armstrong Bros. Tool Co., Chicago
Bath Grinder Co., Fitchburg, Mass.
Vaughn Gun Machine Works, Grand Rapids

Grinders, Drill.

Garvin Machine Co., New York

Grinders, Portable Electric, Hand.

United States Elec. Tool Co., Cincinnati

Grinders, Tool.

Armstrong Bros. Tool Co., Chicago
Bath Grinder Co., Fitchburg, Mass.
Blount, J. G., & Co., Everett, Mass.

Grinders, Pedestal.

Canadian Hart Wheels Ltd., Hamilton

Grinders, Tool Post

Holden Co., Montreal

Grinders, Electric, Tool Post.

United States Elec. Tool Co., Cincinnati

Grinding Holders.

Armstrong Bros. Tool Co., Chicago

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Canadian Hart Wheels Ltd., Hamilton
Dominion Abrasive Wheel Co., Toronto
Gardner, Robt., & Son, Montreal
Garvin Machine Co., New York
Hall & Sons, John H., Brantford
Independent Pneumatic Tool Co., Chicago Ill.
Modern Tool Co., Erie, Pa.
Niles-Bement-Pond Co., New York

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Independent Pneumatic Tool Co., Chicago.

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Gardner, Robt., & Son, Montreal

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Canadian Hart Wheels Ltd., Hamilton
Carborundum Co. Niagara Falls
Dominion Abrasive Wheel Co., Toronto.
Mussens Limited, Montreal.

Hack Saw Frames.

Mussens Limited, Montreal
Simonds Mfg. Co., Fitchburg, Mass

Hammers, Belt Driven.

Francis Hyde & Co., Montreal

Hammers, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.
Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Pneumatic

Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Canadian Rand Co., Montreal

Hammers, Steam.

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Pedrick Conch & Pulley Works, Toronto
Transmart-Turner Machine Co., Hamilton
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Heating Apparatus.

Darling Bros. Ltd., Montreal
Matthews & Yates, Manchester, Eng
Sheldons Limited, Galt

Hobbing Machine.

Schuchardt & Schutte, New York

Hoists, Electric and Pneumatic.

Advance Machine Works Ltd., Walkerville, Ont.
Northern Eng. Works, Detroit

Hose, Air and Steam

Canadian Rand Co., Montreal
Canadian Westinghouse Co., Hamilton
Independent Pneumatic Tool Co., Chicago

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The Canadian Fairbanks Co., Montreal
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

Hydraulic Machinery.

Canadian Yeates Gordon Co., Hamilton
The John Inglis Co., Ltd., Toronto
Fielding & Platt, Ltd., Gloucester, Eng

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.
Schuchardt & Schutte, New York

Index Centres.

Garvin Machine Co., New York

Inspecting Engineers.

Walter R. Dockworth, Montreal

Interlocking Plants and Signals

Montreal Steel Works, Montreal

Intersections, Railway

Montreal Steel Works, Montreal

Iron Filler.

Imperial Waste & Metal Co., Montreal

Jacks.

The Canadian Fairbanks Co., Montreal
Frost, Pyke & Co., Montreal.
H. & E. Lifting Jack Co., Waterville, Que.
Montreal Steel Works, Montreal
Norton, A. O., Coaticook, Que.

Jacks, Compressed Air.

Canadian Rand Co., Montreal

Jacks, Pit and Track

The Canadian Fairbanks Co., Montreal
Montreal Steel Works, Montreal

Jaws, Face Plate.

Cushman Chuck Co., Hartford, Conn.
S. E. Horton Machine Co., Windsor Locks, Conn

Key Seaters.

Garvin Machine Co., New York

Lag Screw Gimlet Pointers.

National Machinery Co., Tiffin, Ohio

Lamps, Arc and Incandescent.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.

Lathe Dogs.

Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford, Conn.

Lathes Bench.

Blount, J. G. & Co., Everett, Mass.
The Canadian Fairbanks Co., Montreal
Hardinge Bros. Inc., Chicago
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Engine.

John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Champion Tool Works Co., Cincinnati, O
Fay & Scott, Dexter, Maine
Gardner, Robt. & Son, Montreal
Garvin Machine Co., New York
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
R. McDougall Co., Galt
Mussens Limited, Montreal.
New Haven Mfg Co., New Haven, Conn
Niles-Bement-Pond Co., New York
Von Wyck Machine Tool Co., Cincinnati

Lathes, Patternmakers.

Fay & Scott, Dexter, Maine

Lathes, Screw Cutting.

John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York

Lathes, Speed.

Mussens Limited, Montreal

Lathes, Spinning.

Bliss, E. W., Co., Brooklyn, N.Y.

Lathes, Turret.

John Bertram & Sons Co., Dundas, Ont.
Blount, J. G. & Co., Everett, Mass.
Bullard Machine Tool Co., Bridgeport, C.
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York
The Pratt & Whitney Co., Hartford, Conn
Warner & Swasey Co., Cleveland, O

Link Belting.

The Canadian Fairbanks Co., Montreal
Jones & Glassco, Montreal
Waterous Engine Works Co., Brantford

Linoleum Mill Machinery.

Bertrams Limited, Edinburgh, Scotland

Locomotives, Air.

Canadian Rand Co., Montreal

Locomotives, Electrical.

Canadian Westinghouse Co., Hamilton

Locomotives, Industrial.

Canadian Yeates Gordon Co., Hamilton

Locomotives, Steam.

Canadian Rand Co., Montreal

Lubricating Plumbago.

Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal
John Millen & Son, Montreal

Machine Divided Rules.

Lufkin Rule Co., Saginaw, Mich

Machine Tool Attachments.

The S. E. Horton Machine Co., Windsor Locks, Conn

Machinery Dealers.

The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Mussens Limited, Montreal
The Smart-Turner Machine Co., Hamilton
Schuchardt & Schutte, New York

Machinery Guards

Canada Wire Goods Mfg. Co., Hamilton

Machinists' Scales.

The Canadian Fairbanks Co., Montreal
Lufkin Rule Co., Saginaw, Mich.

Machinists' Small Tools.

The Canadian Fairbanks Co., Montreal

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Browning Engineering Co., Cleveland
Schuchardt & Schutte, New York

Malleable Iron Furnaces.

Francis Hyde & Co., Montreal.
Standard Engineering Co., Toronto

Mandrels.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
John Millen & Son, Montreal
Morse Twist Drill and Machine Co., New Bedford
The Pratt & Whitney Co., Hartford, Conn

Maple Cogs.

Waterous Engine Works Co., Brantford

Meters, Electrical.

Canadian Westinghouse Co., Hamiton

Mill Machinery.

The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst, N.S.
Waterous Engine Co., Brantford.

Milling Attachments.

Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Bench.

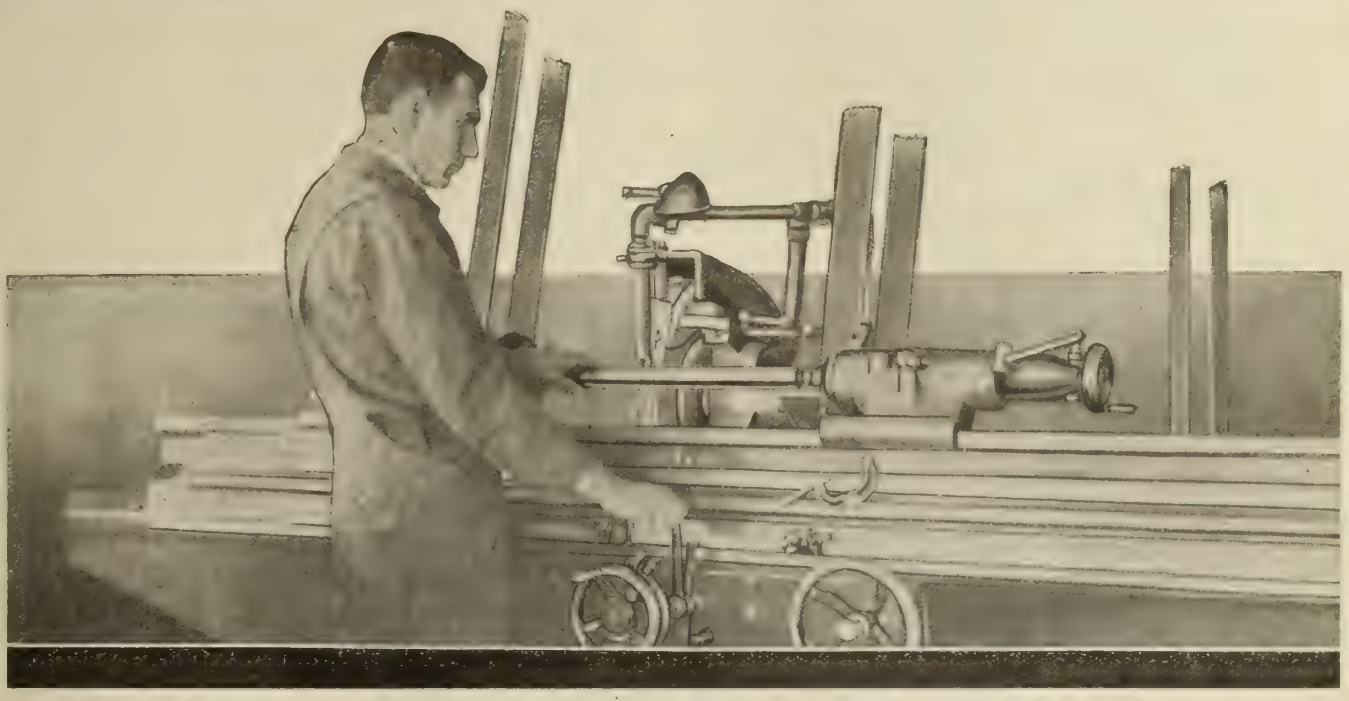
Schuchardt & Schutte, New York

Milling Machines, Horizontal

Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Plain.

Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York



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Garvin Machine Co., New York
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis
London Mach. Tool Co., Hamilton, Ont
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York

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Kearney & Trecker Co., Milwaukee, Wis
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal
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London Mach. Tool Co., Hamilton, Ont.
Mussens Limited Montreal
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Canadian Rand Co., Montreal.
Holden Co., Montreal
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Waterous Engine Works Co., Brantford

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Jones & Glassco, Montreal

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Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

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Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago.

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National Machinery Co., Tiffin, Ohio

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Oil Separators.

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Standard Engineering Co., Toronto

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Whiting Foundry Equipment Co., Harvey Ill.

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Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop.

Cleveland Wire Spring Co., Cleveland

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Hanbury A. Budden, Montreal.
Fetherstonhaugh & Co., Montreal and Toronto
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Hamilton Pattern Works, Hamilton.

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Tallman Brass & Metal Co., Hamilton

Pig Iron.

Stevens, F. B., Detroit, Mich.

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Butterfield & Co., Rock Island, Que.
The Canadian Fairbanks Co., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Garvin Machine Co., New York
John H. Hall & Sons, Brantford
Joshua Heap & Co., Ashton-on-Lyne Eng.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
R. McDougall Co., Galt
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.
Williams Tool Co., Erie, Pa.

Pipe (Second Hand.)

Imperial Waste and Metal Co., Montreal

Planer Drives, Electrical.

Lancashire Dynamo and Motor Co., Ltd., Toronto

Planer Jacks.

Armstrong Tool Bros. Co., Chicago

Planers, Standard.

John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal.
Canada Machinery Corporation, Ltd., Galt, Ontario
Gardner, Robt. & Son Montreal
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
New Haven Mfg Co., New Haven, Conn
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford Conn.
Schuchardt & Schutte, New York

Planers, Rotary.

John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Planing and Shaping Machinery.

Garvin Machine Co., New York

Pliers.

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Schuchardt & Schutte, New York

Pneumatic Tools.

Bliss, E. W., Co., Brooklyn, N.Y.
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Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.

Polishing Materials.

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Canadian Hart Wheels Ltd, Hamilton

Power Plant Equipments.

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Goldie & McCulloch Co., Galt, Ont.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford

Press Guards.

Jones Safety Device Co., Hamilton, Ont

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Bliss, E. W., Co., Brooklyn, N.Y.

Presses, Drop.

W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Niles-Bement-Pond Co., New York.

Presses, Envelope Die

R. E. Kidder

Presses, Forging.

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The Canadian Fairbanks Co., Montreal
United Engineering & Foundry Co., Pittsburg

Presses, Hydraulic.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
United Engineering & Foundry Co., Pittsburg

Presses, Power.

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London Mach Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Pressure Regulators.

The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal

Protective Paint.

Jos. Dixon Crucible Co., Jersey City

Pulp Mill Machinery.

Waterous Engine Works Co., Brantford

Pulleys.

The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
The Goldie & McCulloch Co., Galt.
Oneida Steel Pulley Co., Oneida, N.Y.
Owen Sound Iron Works Co., Owen Sound
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Schuchardt & Schutte, New York
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

Pump Governors.

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Canadian Rand Co., Montreal.
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Hall Engineering Works, Montreal, Que.
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The Smart-Turner Mach. Co., Hamilton

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Gardner, Robt, & Son Montreal
Globe Machine & Stamping Co.
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London Mach Tool Co., Hamilton, Ont.
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Russell Machine Co., St. Catharines, On
Schuchardt & Schutte, New York

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E. W. Bliss Co., Brooklyn, N.Y.
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Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York

Punches, Pneumatic.

Jno. F. Allen Co., New York

Punches, Turret.

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Bertrams Limited, Edinburgh, Scotland
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Quartering Machines.

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London Mach. Tool Co., Hamilton, Ont.

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Montreal Steel Works, Montreal

Rail Braces

Montreal Steel Works, Montreal

Rails, Relaying.

Imperial Waste & Metal Co., Montreal

Rails, Steel

Montreal Steel Works, Montreal

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Francis Hyde & Co., Montreal.
Canadian Rand Co., Montreal

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Francis Hyde & Co., Montreal.
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Raw Hide Pinions.

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Mussens Limited, Montreal.
John Millen & Son, Montreal
New Process Raw-Hide Co., Syracuse, N.Y.

Reamers, Adjustable.

Cleveland Twist Drill Co., Cleveland
The Kelly Reamer Co., Cleveland, O
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

Reamers, Bridge.

Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Reamers, Expanding.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Reamers, High Speed

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Reamer Fluting Machines.

Garvin Machine Co., New York

Reamers, Locomotive.

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The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Reamers, Pipe & Cylinder

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Cleveland Twist Drill Co., Cleveland
The Kelly Reamer Co., Cleveland, O
Morse Twist Drill and Machine Co., New Bedford

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Independent Pneumatic Tool Co., Chicago.

Reamers, Self-feeding.

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Cleveland Twist Drill Co., Cleveland

Reamers, Steel Taper.

Butterfield & Co., Rock Island.
Cleveland Twist Drill Co. Cleveland
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.

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Parmenter & Bulloch Co., Gananoque, Ont.

Riveters, Hydraulic.

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Waterous Engine Works, Brantford

Saw Filing Machines.

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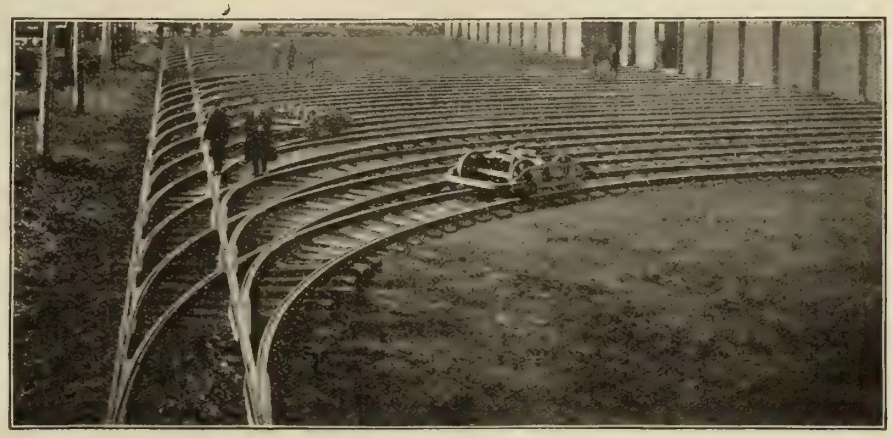
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Geometric Tool Co. New Haven Conn

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The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co. Cleveland
A. B. Jardine & Co., Hespeler, Ont
Morse Twist Drill and Machine Co., New Bedford
Massena Limited, Montreal
Pratt & Whitney Co., Hartford, Conn
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Toronto Testing Laboratory, Toronto

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Bain & Mitchell Montreal

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National Machinery Co., Tiffin, O

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Keystone Mfg. Co., Buffalo
Pratt & Whitney Co., Hartford, Conn

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Armstrong Bros. Tool Co., Chicago

Tool Steel.

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Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
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Armstrong Bros Tool Co, Chicago

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Jones & Glassco Montreal
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The Smart Turner Machine Co., Hamilton
Waterous Engine Co., Brantford

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Tallman Brass & Metal Co., Hamilton
Lamen Bearing Co., Toronto
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John Millen & Son, Montreal

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Darling Bros., Ltd., Montreal
Sheldon's Limited, Galt.

Valves, Steam.

Darling Bros, Montreal
Standard Engineering Co., Toronto

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Darling Bros. Ltd., Montreal

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Darling Bros. Ltd., Montreal
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Canadian Yeates Gordon Co., Hamilton
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The B. Greening Wire Co., Hamilton

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Canada Wire Goods Mfg. Co., Hamilton
Dennis Wire & Iron Works Co., Limited London
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Canada Wire Goods Mfg. Co., Hamilton
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Steel and Radiation, Ltd., Toronto

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Parmenter & Bullock Co., Gananoque

Wire Nail Machinery.

National Machinery Co., Tiffin, Ohio.

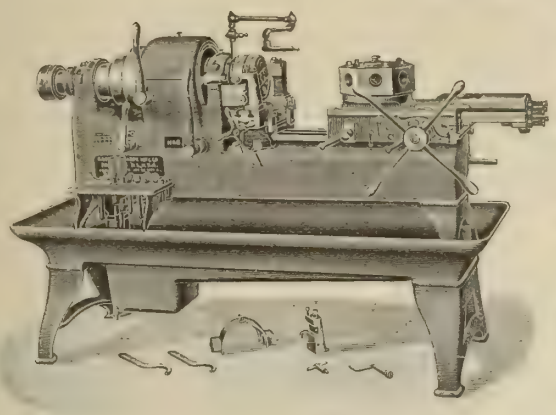
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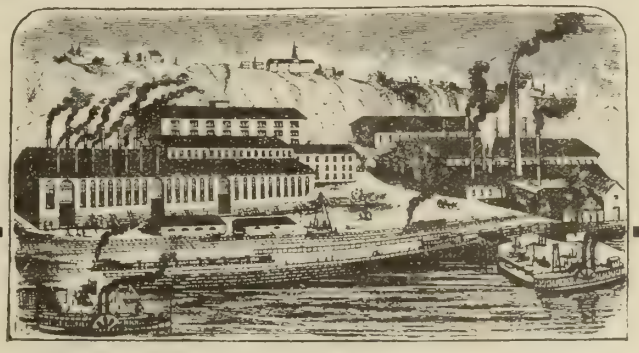
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Jeffrey Mfg. Co, Montreal
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Northern Engineering Works, Detroit
Waterous Engine Co., Brantford.
Whiting Foundry Equipment Co,, Harvey, Ill.

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Browning Engineering Co., Cleveland
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Pneumatic.

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Mussens Limited, Montreal
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

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Montreal
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Northern Engineering Works, Detroit
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Whiting Foundry Equipment Co., Harvey, Ill.

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Stevens F. B. Detroit, Mich.

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Francis Hyde & Co., Montreal
Frederic B. Stevens, Detroit

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Francis Hyde & Co., Montreal.
Stevens, F. B., Detroit, Mich.

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Frederic B. Stevens, Detroit

Riddles.

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Canada Wire Goods Mfg. Co., Hamilton
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
Stevens, F. B., Detroit, Mich.

Sand Blast Machinery.

Rupert G. Bruce Co., Ltd., Toronto
Canadian Rand Co., Montreal.
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
Frederic B. Stevens, Detroit

Sand Molding

Rupert G. Bruce Co. Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co. Montreal,
Stevens F. B., Detroit, Mich.

Sand Sifters.

Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co. Harvey, Ill.

Sieves.

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Canada Wire Goods Mfg. Co. Hamilton
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
Frederic B. Stevens, Detroit

Snap Flasks.

Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.

Sprue Cutters

Bliss E. W., Co., Brooklyn, N.Y.
Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
Stevens, F. B., Detroit, Mich.

Talc.

Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.

Canadian Foundryman Buyers' Directory (Continued)

Track, Overhead.

Francis Hyde & Co., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Trolleys.

Beath, W. D., & Son, Toronto.
The Canadian Fairbanks Co., Montreal
Canadian Rand Co., Montreal.
Francis Hyde & Co., Montreal.
John Millen & Son, Montreal
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Trucks, Dryer and Factory.

Rupert G. Bruce Co. Ltd., Toronto
Francis Hyde & Co., Montreal.
Northern Engineering Works, Detroit
Sheldon's Limited, Galt, Ont.

Frederic B. Stevens, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Turntables.

Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor.
Francis Hyde & Co., Montreal.
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Wheels Polishing.

Rupert G. Bruce Co., Ltd., Toronto
Frederic B. Stevens, Detroit

Wire Wheels.

Rupert G. Bruce Co., Ltd., Toronto
Frederic B. Stevens, Detroit

Canadian Machinery Buyers' Directory (Continued)

Wood Boring Tools, Pneumatic

Holden Co., Montreal

Wood Refuse Collecting Plant.

Matthews & Yates, Manchester Eng

Woodworking Machinery.

The Canadian Fairbanks Co., Montreal
Fay, J. A., & Egan Co., Cincinnati
Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford

Wrenches.

Canadian Billings & Spencer, Ltd., Welland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Wrenches, Automobile Narrow Jaw.

Bemis & Call Hardware and Tools Springfield, Mass.
John Millen & Son, Montreal

Wrenches, Automobile Monkey.

Trimont Mfg. Co., Roxbury, Mass.

Wrenches, Basin.

Bemis & Call Hardware and Tool Co Springfield, Mass.

Wrenches, Monkey.

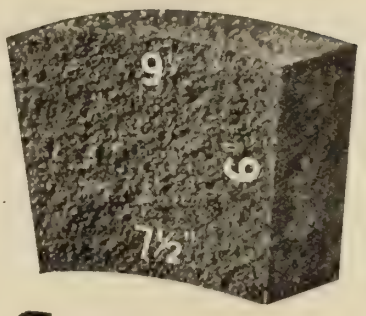
Bemis & Call Hardware and Tool Co. Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.
John Millen & Son, Montreal

Wrenches, Pipe.

Bemis & Call Hardware and Tool Co., Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.
Reed Mfg. Co., Erie, Pa.

Wrenches, Ratchet.

Keystone Mfg. Co., Buffalo



FIRE BRICK *for* Cupolas

¶ The standard Fire Clays by which all other Clays are judged are those of Pennsylvania.

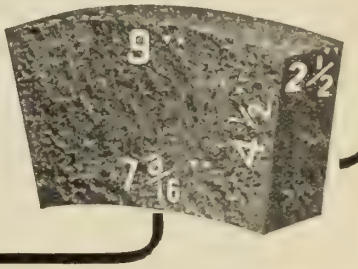
¶ They're the ones from which our Cupola Brick are made.

¶ The cost per thousand means nothing unless you know the results the Brick are giving.

¶ Write us for definite examples of how our material affects your melting costs.

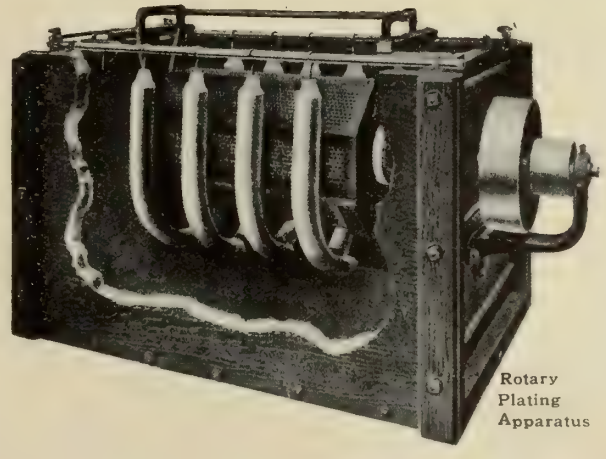
HARBISON-WALKER REFRACTORIES COMPANY,

PITTSBURGH, PENNSYLVANIA



Electroplaters' Supplies, Foundry Facing and Equipment

Galvanizing Salts
Nickel Salts
Nickel Anodes
Zinc Anodes
Copper Anodes



Rotary Plating Apparatus

Canvas Wheels
Felt Wheels
Bull Neck Wheels
Muslin Buffs
Tripoli and
Buffing Compositions

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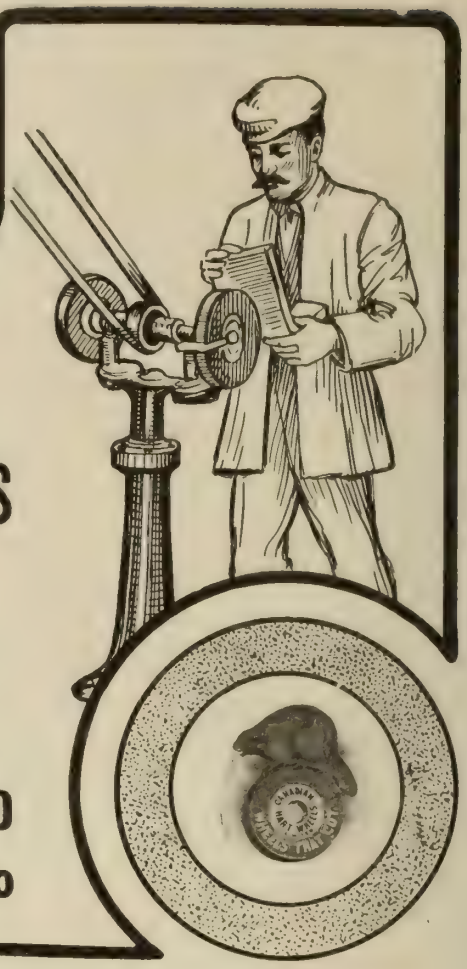
Our Mechanical Plating Apparatus will plate large quantities of small work in bulk, will save TIME, LABOR and EXPENSE, and in many instances will eliminate the necessity of buffing after plating.

To prove their merits we will plate sample lots free of charge. WRITE FOR BULLETIN 117.

RUPERT G. BRUCE COMPANY, Limited

PHONE MAIN 3633 — 96-98 Queen Street East, Toronto, Ontario

The Daily Grind



The daily grind of mechanics engaged in using abrasive wheels is made much more effective if their machines are fitted with

CANADIAN HART CORUNDUM WHEELS

Our wheels are free and fast cutting, porous, safe, and very durable. Send for our catalogue which describes the various processes used in making Canadian Hart Corundum and Emery Wheels.

CANADIAN HART WHEELS, LIMITED

Hamilton, - - - - Ontario

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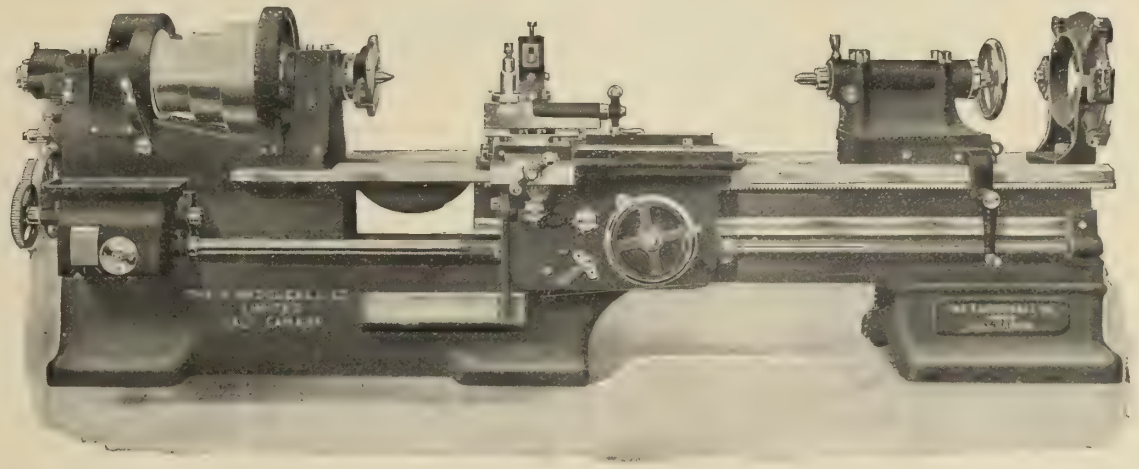
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Canadian Wood Working Machinery Co., Ltd. .. 5
Canadian Wood Working Machinery Co., Ltd

INCREASED EFFICIENCY Means INCREASED PROFITS



THIS new gap lathe, with its extra speed and absolutely rigid construction, will increase the efficiency of any shop. Notice the extra strong construction of the gap. The carriage and apron also are so constructed that they will not spring under the most severe strain. The head stock will not chatter. The tail stock is adjusted from the top, saving much of the operator's time. Friction safety feeds give quick changes of thread and double back gears give eighteen distinct spindle speeds. In every way this new Gap Lathe will prove to be a paying investment. Full equipment is supplied with each lathe.

Headstock construction prevents chattering, and deep oil chambers fitted with ring oilers make spindles and bearings self-oiling and always well lubricated.

Tailstock of a special type, and sleeve is clamped by a quick acting locking device. Tailstock is secured to bed by bolts adjusted from the top where they are easily accessible.

Bed, non-springing and webbed, and braced to secure rigidity.

Gap, vibration absolutely prevented by use of brace supports to carriage.

Spindle, high carbon hammered steel in solid chilled cast iron bearings, accurately fitted and self oiling.

Carriage and Apron, non-springing under severest strain, full "V" bearings and flat bearings in addition on front ways.

Double Back Gears give eighteen distinct spindle speeds, suiting lathe to work on widely different diameters.

Compound Rest, with graduated base, accurately fitted taper gibs, end adjusted. Screws in both rest and cross slide read to thousandths.

Friction, Safety Feeds, screw and rod feeds cannot be both engaged at the same time. Quick changes of 1¼, 2½ and 5 times thread being cut.

Gears and Racks, cut from solid and steel where necessary.

Screw Cutting, full range of commercial threads provided for.

Equipment, Compound rest, steady rest, follow rest, large and small face plates, wrenches, two speed, friction countershaft furnished with each lathe.

Accuracy, Strength, Solidity, Wear. These are the paramount features behind all McDougall Machines. Made **to meet extreme demands.**

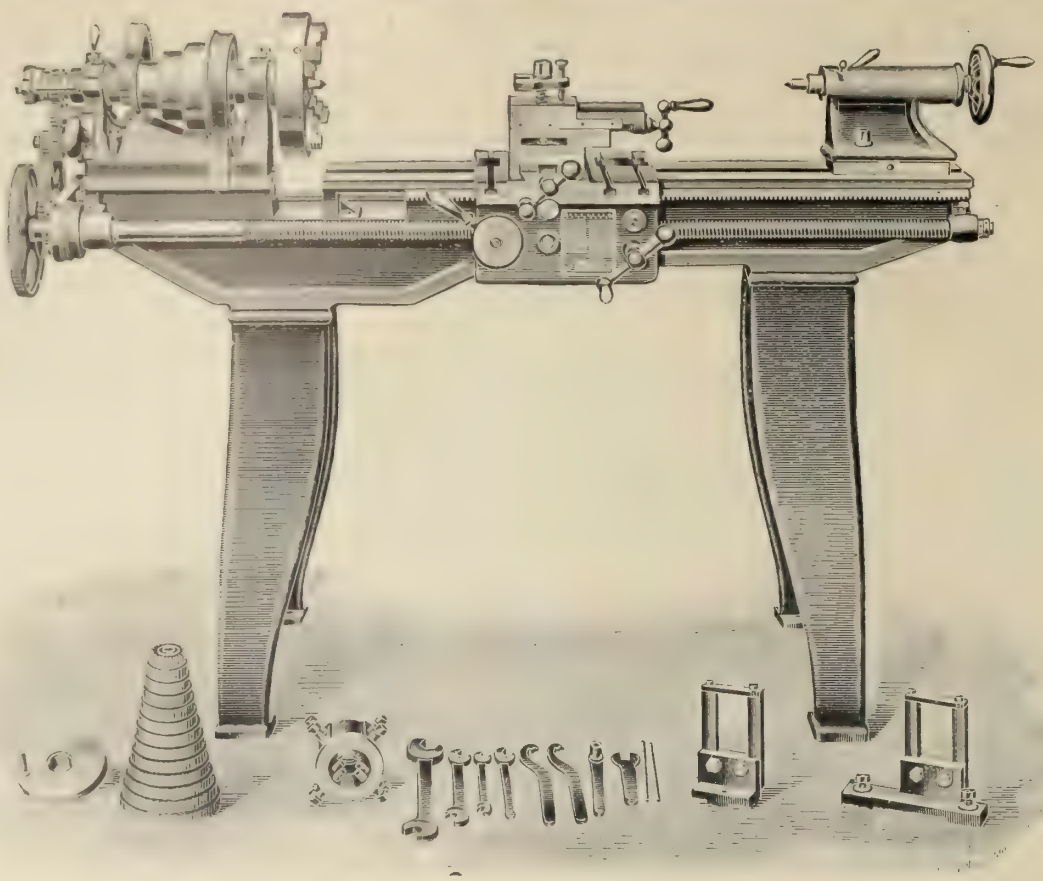
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The R. McDougall Co., Ltd.

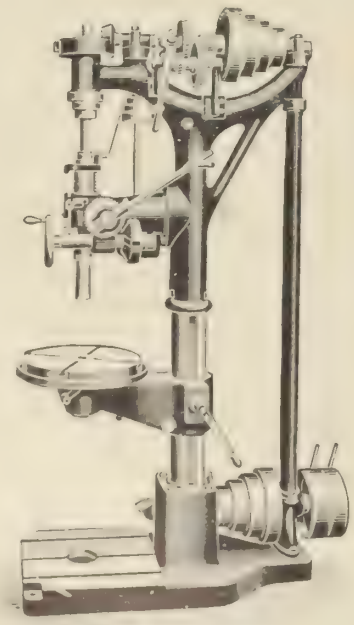
GALT, ONTARIO

Canadian Fairbanks Company, Sales Agents **Cable Address: Dougalt, A.B.C. 5th edition**

Hollow mandrel, 1 inch diameter Saddle has large T slots.



Cuts Whitworth, Gas, Metric and International Threads.



Precision Lathe "Adalia"

12-inch swing without the gap, 1 inch hollow spindle. New and improved design. Best and cheapest screw-cutting lathe on the market. Specially suitable for accurate tool work and light engineering. Length of bed 6 feet, distance between centres three feet 4 inches.

Vertical Drilling Machine "Luna"

with self-acting feed, automatic stop and double disengaging Back Gear. Spindle with end-thrust ball-bearing, drilling holes up to 2 inches.

Distance from spindle to column	12½ inches
Distance between spindle and base plate	42 inches
Diameter of table	17 inches.
Approximate weight	900 lbs.

Ask for Prices

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MONTREAL TORONTO COBALT WINNIPEG CALGARY VANCOUVER

ALPHABETICAL INDEX ON LAST PAGE

CIRCULATES EVERYWHERE IN CANADA

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

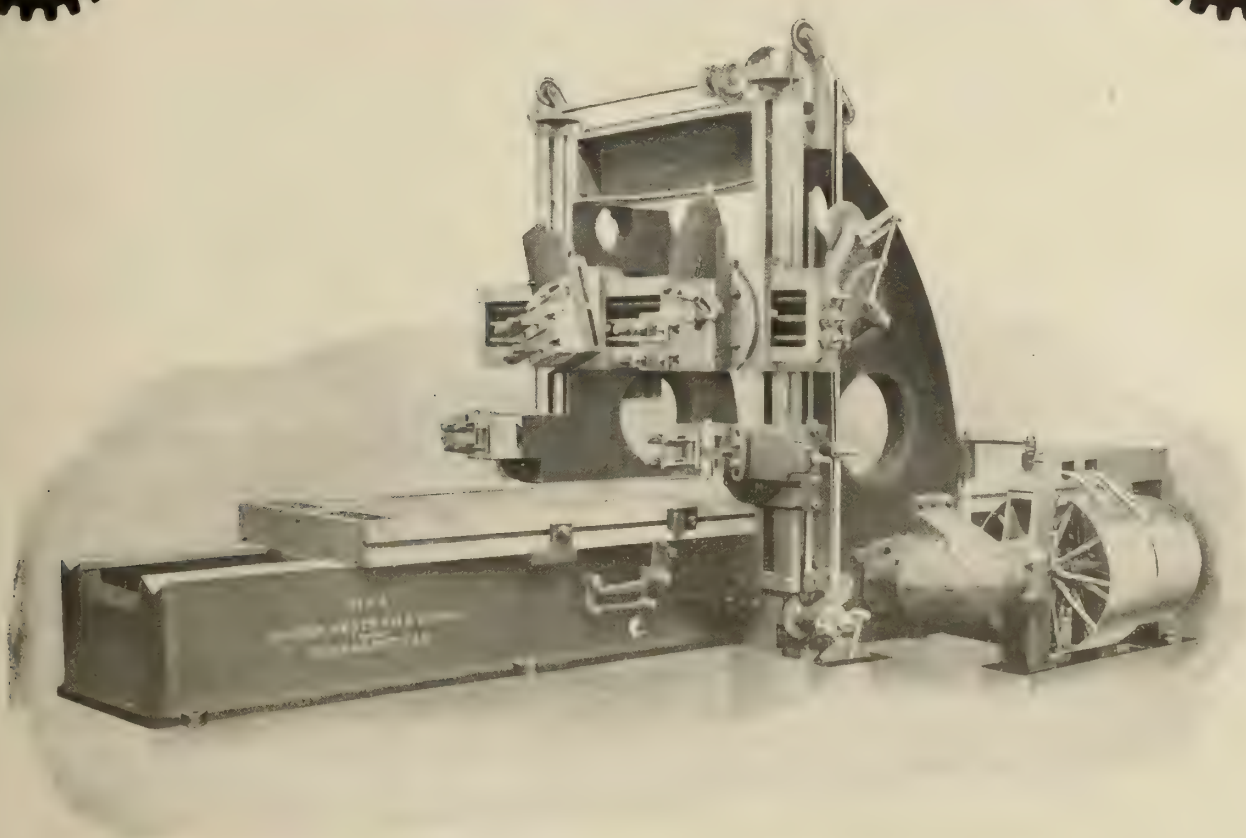
MONTREAL, Eastern Townships Bank Bldg. TORONTO, 143-149 University Ave. WINNIPEG, 511 Union Bank Building. LONDON, ENG., 88 Fleet Street, E C

Vol. VII. Publication Office: Toronto, April, 1911. No. 4

JB&SCO

BERTRAM PLANERS

JB&SCO



BERTRAM 54 x 54 inch IRON PLANING MACHINE with four cutting heads.
Equipped with our Patented Four-belt Drive.

Particulars Sent on Request.

The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO, CANADA

Agents:—The Canadian Fairbanks Co., Ltd. Offices:—Montreal, Toronto, Winnipeg, Vancouver, Calgary, Saskatoon, St. John.

Variable Speeds Without Complication

Without Resorting to Clutches, Belts or Sliding Gears

IN the Pond Reversing Motor Planer is offered an entirely new method of driving and reversing at variable speeds. This system is the result of years of experimenting in this line, and has proven itself absolutely reliable under the most severe and adverse working conditions. It overcomes all the undesirable features of belt and gear-box drives and does away with all clutches, either pneumatic or magnetic, all shifting belts and all sliding gears.

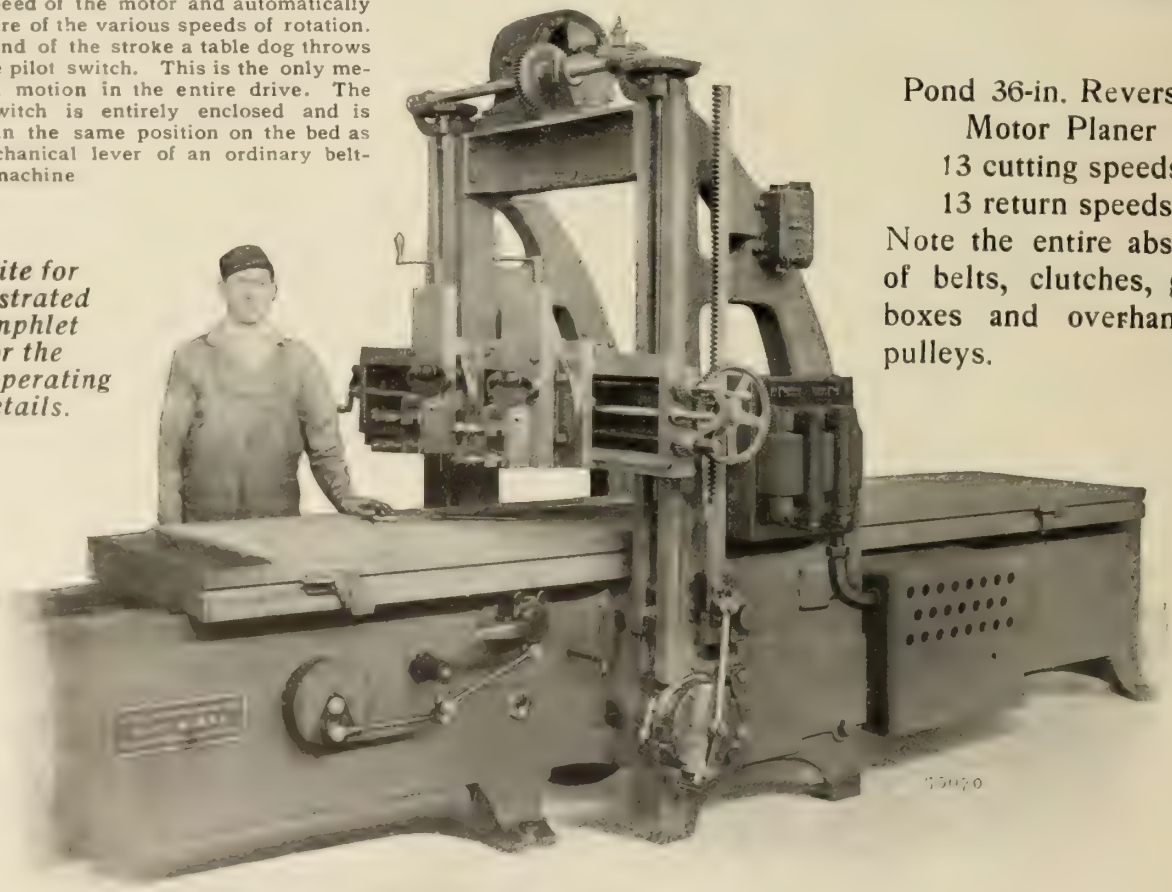
The reversing drive essentially consists of one motor which acts as a generator at the instant of reversal. This result is accomplished automatically by a patent controller. On the controller are mounted two index scales—one controls the range of cutting speeds and the other the return speeds. Each scale is provided with 13 graduations or divisions, by means of which an equivalent number of different motor speeds are obtainable by simply sliding the thumb piece on the scale. There are no dash-pots in the system

Pond Reversing Motor Planer

With reversing motor connected direct to pinion driving shaft

The cutting speeds obtainable on the standard type of planers vary from 25 to 40 feet per minute, and the return speeds from 60 to 100 feet. However, these speeds can be changed to suit any individual requirements. The cutting and return speeds are entirely independent of each other, so that it is possible to use the slowest cutting speed and the highest return speed, or vice versa. The table is reversed by adjustable dogs which throw the controller into the dynamic position, the current which is generated at this instant bringing the motor to a stop.

At the instant of reversal, in which the motor is being brought to a stop, the controller automatically reverses the main circuit to motor, which gives the reverse direction of rotation The dynamic feature of the controller is absolutely dependent upon speed of the motor and automatically takes care of the various speeds of rotation. At the end of the stroke a table dog throws over the pilot switch. This is the only mechanical motion in the entire drive. The pilot switch is entirely enclosed and is placed in the same position on the bed as the mechanical lever of an ordinary belt-driven machine



Pond 36-in. Reversing Motor Planer
13 cutting speeds
13 return speeds
Note the entire absence of belts, clutches, gear-boxes and overhanging pulleys.

Write for illustrated pamphlet for the full operating details.

NILES-BEMENT-POND CO.

111 Broadway, New York. 25 Victoria Street, S.W. London

Sales Agents—THE CANADIAN FAIRBANKS COMPANY, LIMITED

Montreal St. John Toronto Winnipeg Calgary Vancouver

Indispensable in Confined Corners

The

Bemis & Call

ADJUSTABLE "S" NUT WRENCH



An extremely useful tool for working in confined corners, and places where a monkey wrench cannot be used.

We also make an adjustable "S" Wrench for pipe work.

All parts are interchangeable and are thoroughly hardened and tempered.

Write for complete Catalogue of Wrenches.

Bemis & Call Hardware and Tool Co.

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Three Measurements At One Setting

¶ The S & S Vernier Caliper is a clever combination of three precision measuring tools. The inside diameter, outside diameter and depth are obtained at one setting, without deduction. ¶ This is the only caliper on the market having the convenience of a depth measure. The accuracy of this tool is that found only in first class makes.



$3.10

This price includes a genuine leather case. It fits easily and comfortably into your side pocket and is always at hand ready to take measurements of any nature. Stamped with the firm's name without extra cost when reasonable quantities are purchased. Write for Circular. *Liberal discount to dealers.*

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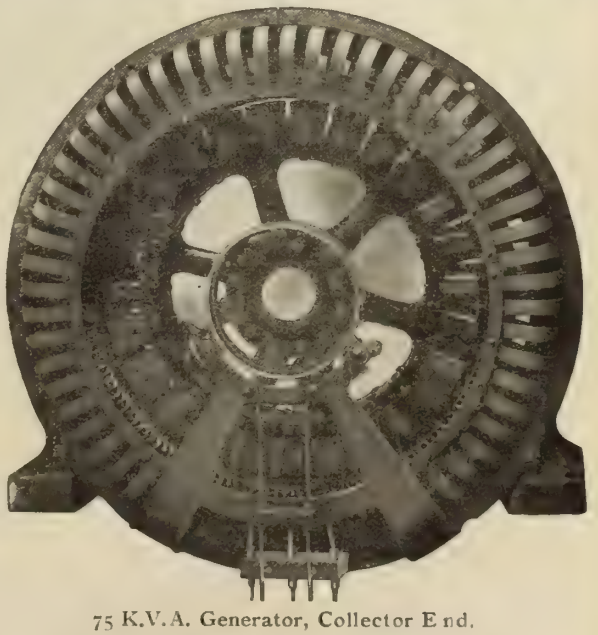
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Westinghouse Engine-Type Alternating-Current Generators

50-1100 Kva. 60 Cycles. 240-2400 Volts.

This line of slow speed generators is arranged for direct mounting of the rotor on the engine shaft, which, together with the bearings, is supplied with the prime mover.

Economic use of properly distributed materials and general excellence of design and construction are united in the construction of these generators. For moderate first cost, consistently satisfactory performance and low maintenance charges, these machines are unsurpassed by any alternating-current generators on the market. They are specially suited for industrial isolated plants and moderate capacity central stations.

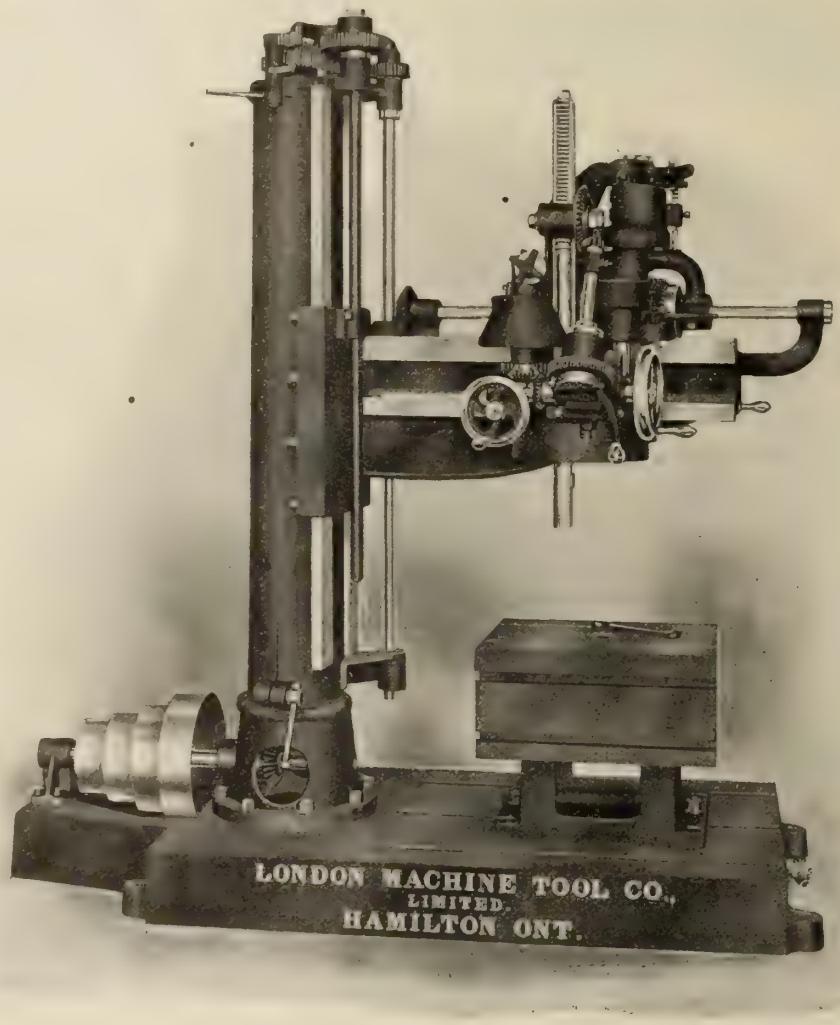


75 K.V.A. Generator, Collector End.

Canadian Westinghouse Co., Ltd., Hamilton, Ont.

TORONTO	MONTREAL	HALIFAX	WINNIPEG	CALGARY	VANCOUVER
Traders Bank Building	52 Victoria Square	Telephone Bldg.	158 Portage Avenue East	311 8th Avenue West	439 Pender Street

DO NOT FORGET that we are making new "London" Heavy Duty Lathes of the Le Blond type, a Lathe that is making everybody "sit up and take notice."



THREE-FOOT RADIAL DRILL.

This machine has the power of a much larger drill, without sacrificing convenience or speed. Note that the spindle is driven from the LOWEST POINT—the most logical point—reducing torsion on spindle and pressure on driving keys. Spindle is 2¼ inches in diameter. Compare this with other Radials. Back gears and tapping attachment on head; all bearings bronze bushed; double column. Made with speed box at additional price.

Prompt delivery. Full particulars on request. This drill is made in 3, 3½, 4, 5 and 7-foot sizes.

London Machine Tool Co., Limited

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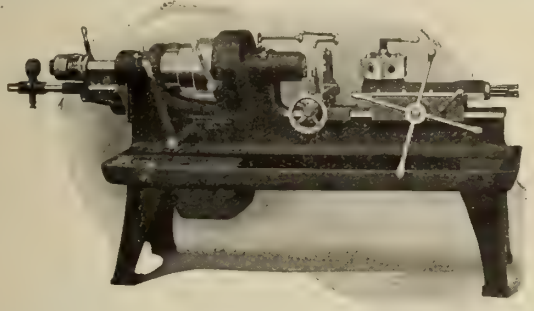
CLEVELAND, OHIO, U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams & Wilson, Montreal

TURRET LATHES OF TWO TYPES

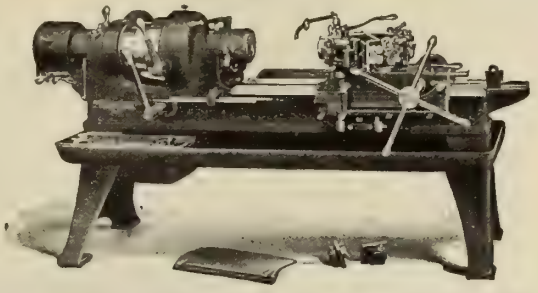
Designed and built for every turret lathe requirement from 5/8 in. to 3 5/8 in. chuck capacity bar stock.

All the power, all the speeds, all the other facilities necessary for obtaining and maintaining a higher quality and quantity limit are found in the Warner & Swasey Turret Lathes.



Turret Screw Machines have every facility for rapid, accurate and economical production of screws, studs, bolts and similar pieces from round, square or hexagonal stock.

These machines are built in five sizes, for bar work up to 3§ inches in diameter and 14 inches long.

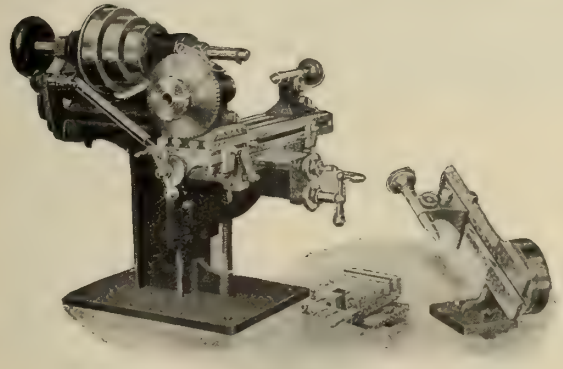


Hollow Hexagon Turret Lathes have all the facilities known to modern practice for rapid and accurate production.

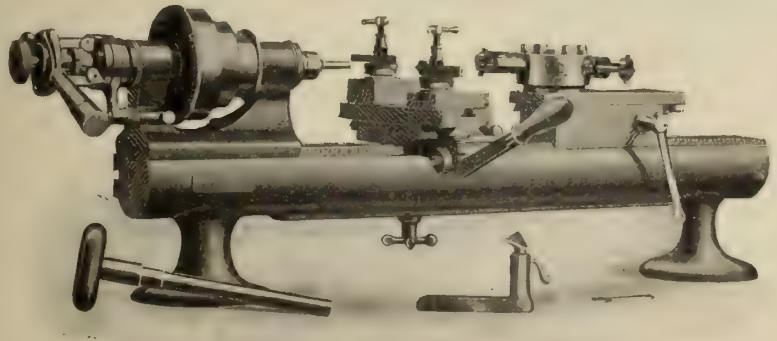
SIZES

No. 1. Turns Diameters up to 1½ inches. Lengths up to 18 inches.
No. 2. Turns Diameters up to 2¼ inches. Lengths up to 24 inches.
No. 3. Turns Diameters up to 3⅛ inches. Lengths up to 36 inches

Our engineering department is at your service for advice regarding your requirements in equipment of this kind. Ask us for estimates of output.



Write for Catalog No. 190.



The Hardinge Bench Miller

will do work which cannot be handled on Standard Large Milling Machines, and will do some of the work now being done at a loss on large machines.

AS YOU LIKE IT

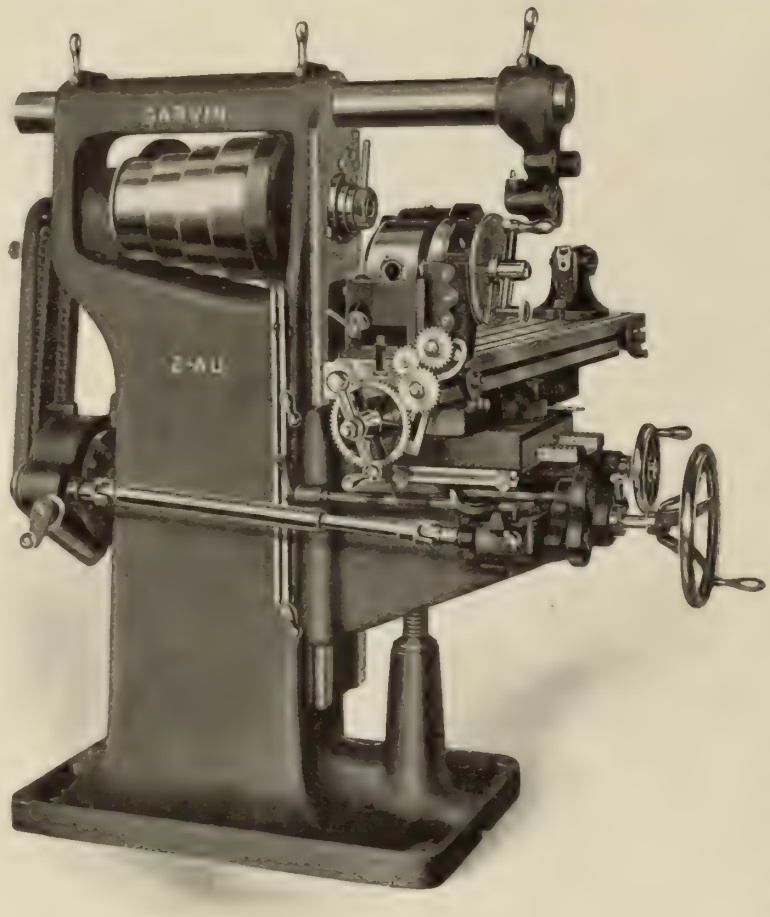
A Bench Lathe, or a Screw Machine, with Automatic Chuck Closer, Double Tool Cross Slide and Turret. Drill, Tap and Die Holders carried in stock.

Hardinge Bros. Inc.

3133-3141 Lincoln Avenue
Chicago - Illinois

GARVIN NO. 2-A (ALL FEEDS)
Universal Milling Machine

IS THE MACHINE FOR YOUR TOOL-ROOM.---RIGID AND ACCURATE



GARVIN No. 2-A Universal Milling Machine.
(Automatic Feeds in all directions.)
Use Code.....ANIMUS.

Power Feed with reverse and automatic trip is provided in all directions, table, in and out and up and down. The feed movements are all controlled by one handle with which the knee, saddle or slide can be started, stopped and reversed. The table has an independent trip handle in addition.

Ten Positive Feed Gear Changes are secured, doubled to twenty when back-gears are used. The accelerated feed of table is received, when large diameter cutters are being used and the spindle is running slow. The Feed can be changed while machine is in cut.

Machine is equipped with our Double Geared Dividing Head, our

Solid Top EXTENDED (Patented) **Knee**

and many other valuable features exclusive to GARVIN Milling Machines.

DIMENSIONS.

Automatic Table Feed	25 in.
Automatic Feed of Saddle	8 in.
Automatic Feed of Knee	18 in.
Dimensions of Table over all	48x9 in.
Taper Hole in Spindle B&S (Positive drive)	No. 10.
Width of Belt required	3 in.
Number of Speed Changes	16
Number of Feed Changes	20
Floor Space required	74x84 in.
Crated Weight	3,500 lbs.

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

Send for Descriptive Circular No. 159

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

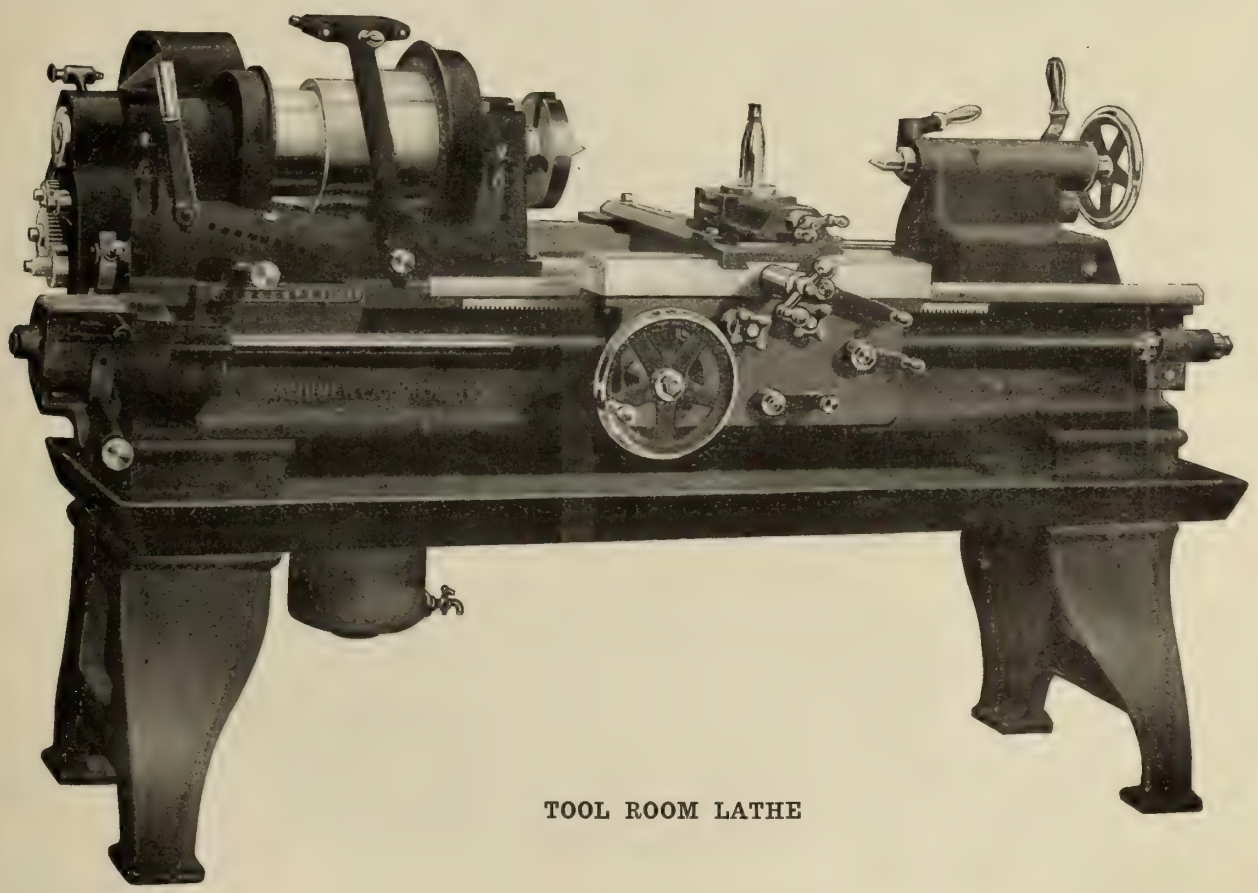
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Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.

LATHES

Shapers, Planers, Slotters, Punches, Shears

Latest Designs, Finest Workmanship



TOOL ROOM LATHE

Note the appearance of this machine. Hundreds of them in use, and every one giving satisfaction. One grade only and that the best.

Write for Catalogue.

Canada Machinery Corporation, Limited

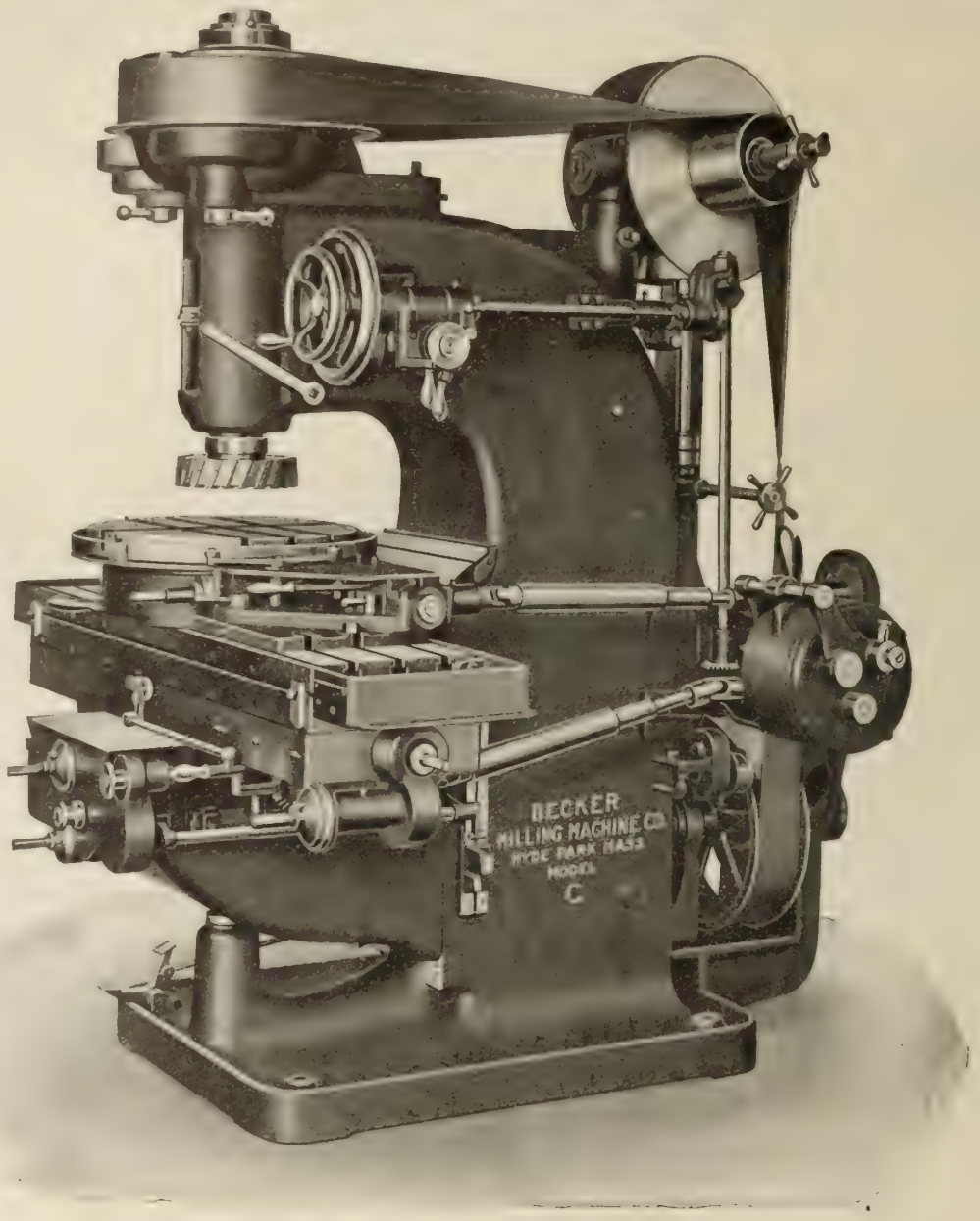
GALT, ONTARIO

Agents:

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Williams & Wilson, Limited, Montreal. A. R. Williams, of Vancouver, Limited

Becker Vertical Spindle Milling Machines

New Model "C" for Heavy Milling



Some Features of this Machine

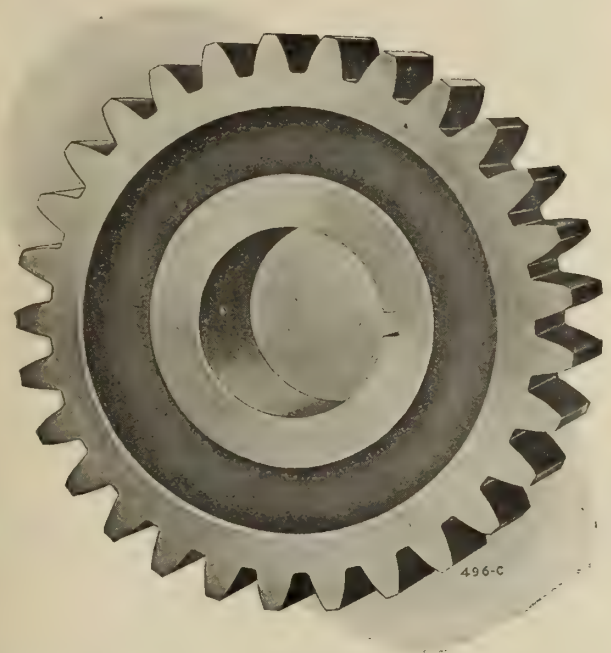
THE QUESTION OF POWER CONSUMPTION is one needing special consideration. It is generally considered that all-gear driven spindles consume much more power than an open belt driven machine. Model "C" Vertical can be driven by a 5h.p. variable speed motor. Tests made show a consumption of 4 electrical h.p. when removing 20 cubic inches of cast iron per minute, and when milling soft steel at the rate of 10 cubic inches per minute a 5h.p. consumption. We solicit a comparison of this test with results made by all-gear driven vertical milling machines.

THE ADVANTAGES OF OPERATING A MILLING MACHINE SUCCESSFULLY on heavy cuts without back gears in mesh is too well known to need enlarging upon. We desire only to call special attention to the fact that the Model "C" is designed to perform satisfactorily the average work in the average shop without any spindle gears in mesh. Constant torque of the spindle under direct belt action insures smooth work and reduces chattering, thus making the new Becker a power in its field.

Full specifications on request. Catalogue 56C for general description.

THE BECKER MILLING MACHINE COMPANY, HYDE PARK, MASS., U.S.A.

The Cincinnati High Power Gearing



One of the Cincinnati forged steel, spindle driving gears, with accurately cut teeth having 20 degrees pressure angle. Note the great strength indicated by their large root section.

ALL the spindle drive gears on our High Power Millers are made from steel forgings.

Our gear teeth have 20 degrees pressure angle which produces teeth having an unusually large root section and correspondingly increased strength.

Our gear train is of the simplest form.

There are only 12 gears altogether between the driving pulley and the cutter. Only a few of these are used at one time. For example—each one of the eight fast speeds is obtained by driving through only the two tumbler gears, the cone gear and one of the sliding gears; only one gear more than has always been used on the ordinary single back geared machines.

The eight slow speeds employ the additional gears, I J K and L, which provide a total Back Gear Ratio of 25 to 1 on the larger machines.

All the other gears, in each case, are idle, held in reserve ***For Providing Changes In Speed.***

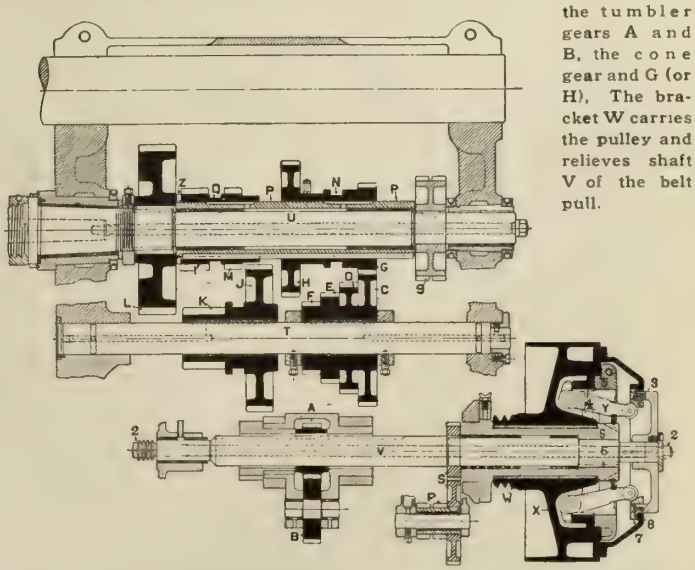
None of the shafts are subjected to combined bending and torsional strains. All shafts are supported in adequate bearings at both ends.

The pulley runs on a bracket (W), relieving the driving shaft of the belt pull.

Transmission for all speeds is through the face gear keyed to the spindle close to the front box, relieving the length of the spindle from torsional strains.

Never any gears in mesh except those needed to give the speed being used. Tumbler automatically clamped to its bearing on the machine frame at each one of its positions, eliminating vibration in these parts.

The Cincinnati gear train set for one of the eight fast speeds, which use only the tumbler gears A and B, the cone gear and G (or H). The bracket W carries the pulley and relieves shaft V of the belt pull.



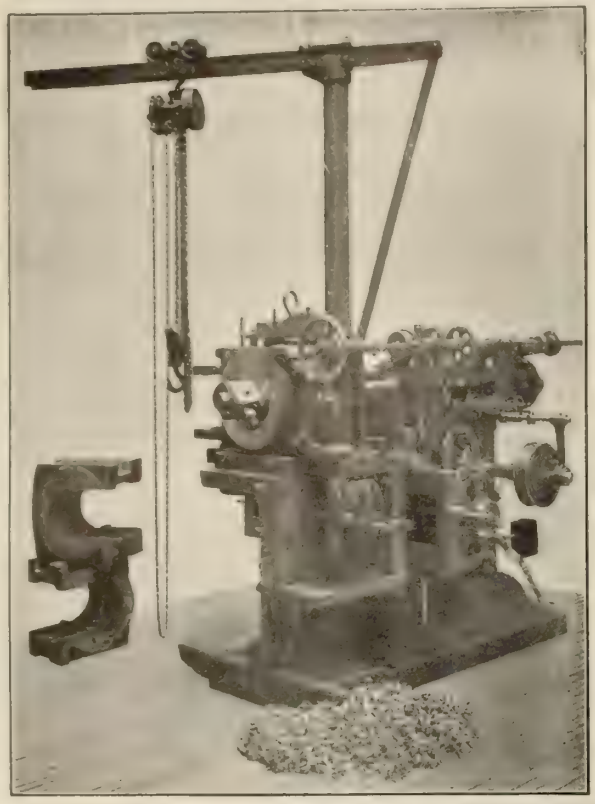
We are Milling Machine Specialists

The Cincinnati Milling Machine Company

CINCINNATI, OHIO, U.S.A.

Canadian Agents—H. W. PETRIE, Limited, Toronto, Montreal and Vancouver.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1/8 to 6 inch pipe; Bolts 1/8 to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2"; ½" to 3"; 1" to 4"; 1½" to 6"; 2" to 8" and 3½" to 12".

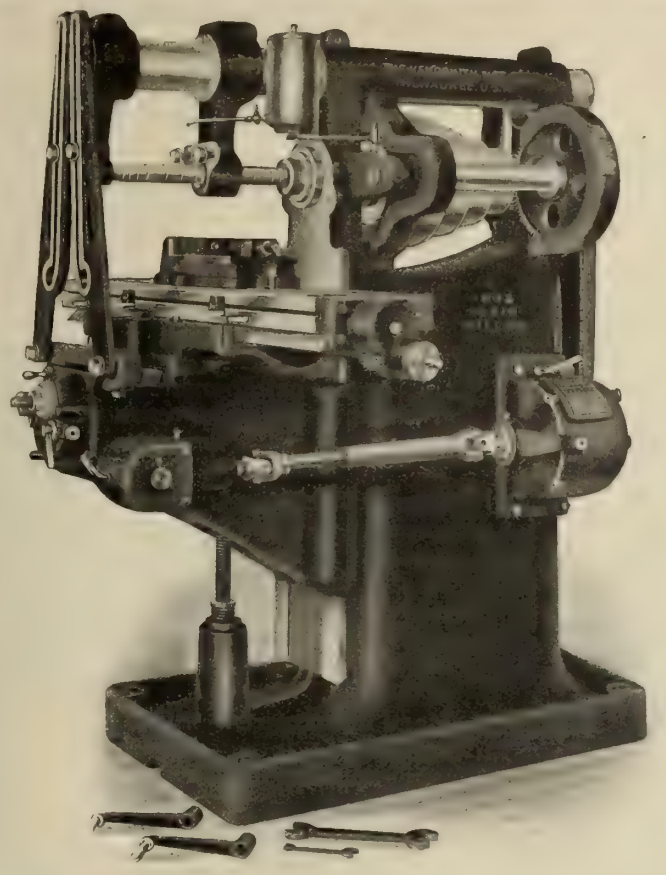
Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.



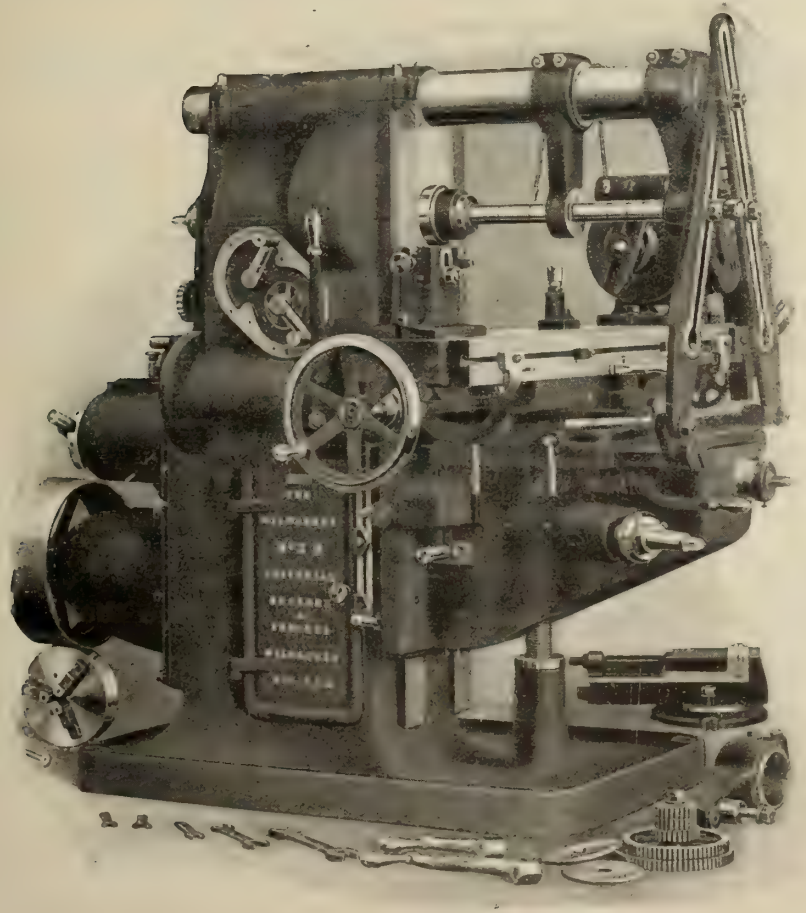
KEMPSMITH
MILLING MACHINES

In every point which affects the real productive value of the machine—(range of automatic table feeds; general capacities; belt power; weight, efficiency of entire automatic feeding and operative mechanism; accuracy of construction, etc.)—in all of these, our machine has distinct and positive advantages.

WE HAVE PROOFS

THE KEMPSMITH MFG. CO.
MILWAUKEE, WISCONSIN

Canadian Agents:
RUDEL-YEATES MACHINERY CO., MONTREAL



THE MILWAUKEE

No. 3B Universal Miller

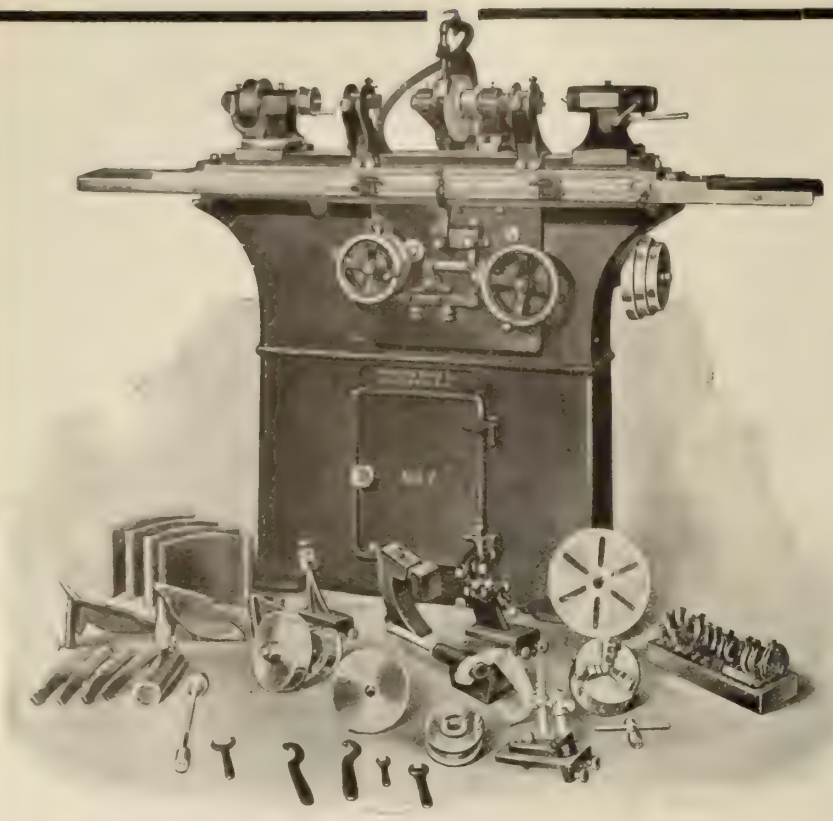
is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

Let us send you more particulars.

Kearney & Trecker Co.

Manufacturers - Milwaukee, Wis.

Agents:
The A. R. Williams Mach'y Co., Toronto
Williams & Wilson - Montreal



Every up-to-date Machine Shop should have a

"Modern" Universal Grinder

Its many points of superiority over ordinary universal grinders are fully described in our illustrated catalogue, a copy of which will be mailed to you **Free on Request.**

We would also be glad to place our experience at your disposal

This machine is more rigid and durable, and is better made than most grinders, and it produces more work and better work than any similar machine made.

Among the many improvements incorporated in the Modern Universal Grinder is our new patented table hand wheel stop, which STOPS HAND WHEEL WHILE TABLE IS IN MOTION, thereby eliminating the shock from the quick reverse of the hand wheel.

Made in two sizes—sold at interesting prices. It will be worth your while to write us before buying.

MODERN TOOL CO., Erie, Pa., U.S.A.

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

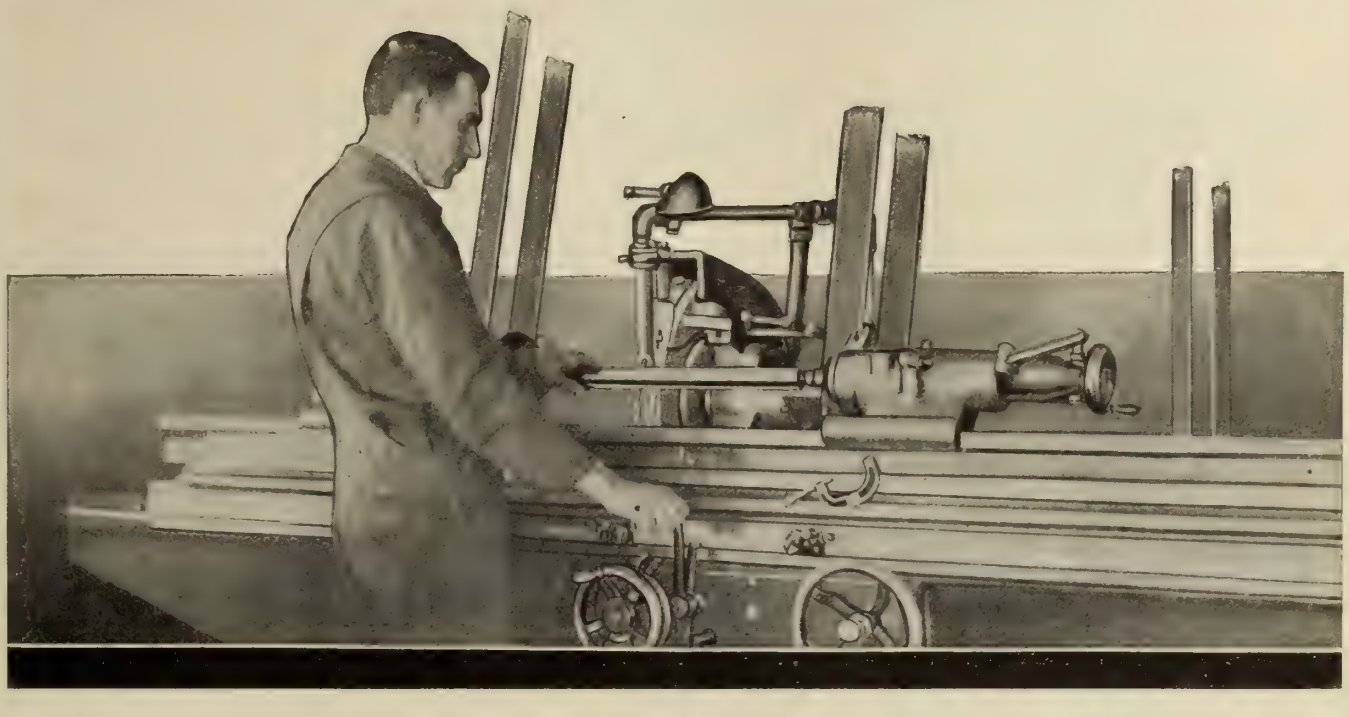
Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

The advertiser would like to know where you saw his advertisement—tell him.



Carborundum—The Uniform, Durable, Fast Cutting Grinding Wheel

In grinding Bessemer steel shafts in a big Eastern machine building plant Carborundum Grinding Wheels cut faster, last longer and are more uniform in quality than any other grinding wheels that have ever been tried.

The shafts are 72 inches long and $1\frac{15}{16}$ inches in diameter. Carborundum Wheels remove the stock at the rate of one hundredth of an inch, with but two thousandths of an inch wheel loss—Fast cutting and durable. Another important fact—Corborundum Wheels invariably retain an absolutely true surface—uniformity—The operator says that Carborundum Wheels are the **only** ones with which he can get these results.

It would be to your advantage to let us know about *your* grinding problems. We can help you to maximum results by giving you the right wheel for the right place.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N.Y.

OUR
No. 264 SELF-FEED RIP SAW

Embodies in its construction all features that are necessary for the satisfactory handling of light or heavy material.



No. 264 Self-Feed Rip Saw.

It is equally efficient in ripping SHORT or LONG Stock. Both the in-feeding and out-feeding roll may be adjusted close to the saw, permitting short stock to be fed without trouble.

The Feed Rolls may be instantly raised, converting it into a hand-feed machine when desired.

The table raises and lowers to accommodate different thicknesses of stock.

Capacity—Rips 4 in. thick with a 16 in. saw, and 8 in. with a 24 in. blade. Takes 19 in. between saw and fence.

WRITE FOR LARGE ILLUSTRATED CIRCULAR

J. A. Fay & Egan Co.

362-382 W. Front Street

CINCINNATI OHIO

A High-Grade Small Engine Lathe at Moderate Cost!

With or Without Quick Change Gear Device.—Three or Five Step Cone. You can use one in YOUR shop.



FREE from fussy attachments and mere talking points, the Von Wyck 15-inch engine lathe offers such a combination of convenience and economy that operators maintain, "It is unequalled by any lathe of its swing."

WHY buy a large size and pay a big price to get great strength and efficiency? Von Wyck design and construction are thoroughly high grade in every important detail and satisfactorily cover an unusual range of work.

VON WYCK

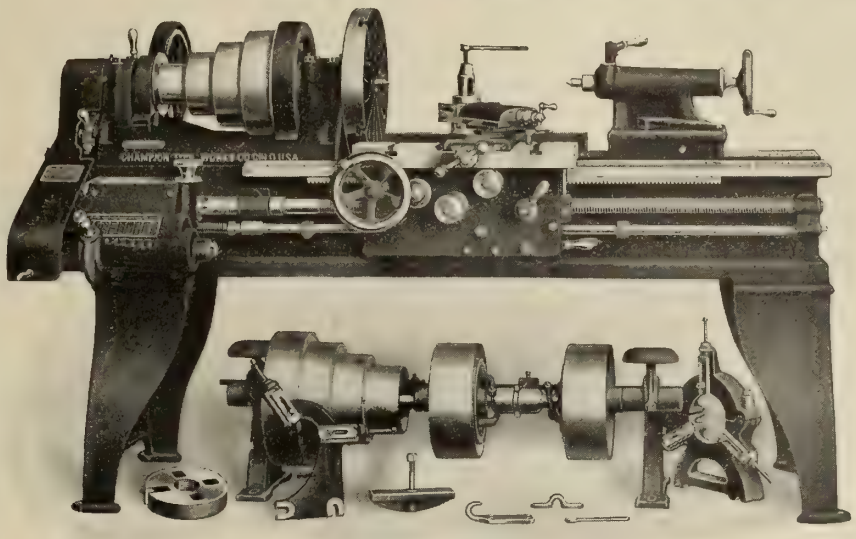
MACHINE TOOL COMPANY

Cincinnati, O., U.S.A.

Rudel-Yeates Machinery Co., Montreal

Canadian Agents

THE MODERN LATHE



16-in. Quick Change Lathe.

A glance at the accompanying cut will show you—

1st—A good-looking lathe.

2nd—A well-proportioned lathe

3rd—A lathe with gears completely enclosed.

Send for a catalogue of

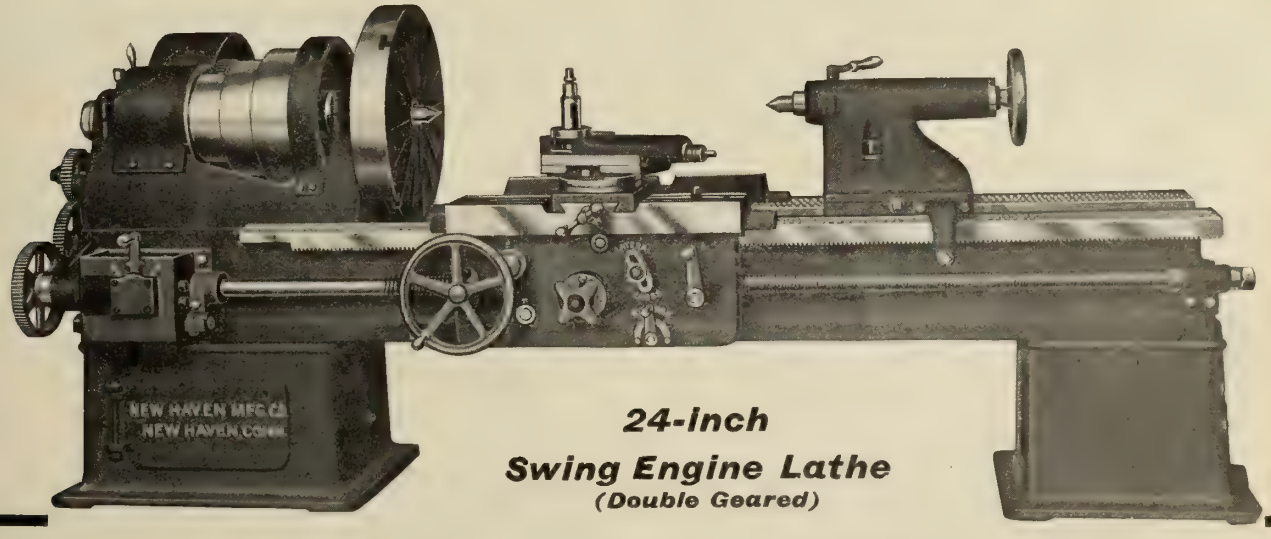
CHAMPION LATHES

and we think we can show you more than mere good looks. It will show you a lathe of ample proportions for taking the heaviest cuts, as well as doing your most accurate tool-room work.

Built in 5 sizes—10-12-14-16 and 18-inch swing. All the special attachments.

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.



24-inch

Swing Engine Lathe

(Double Geared)

The above is an illustration of the favorite

NEW HAVEN LATHE

so well and favorably known in a number of engineering shops for its accuracy, durability and reliability.

Every New Haven Lathe has our unrestricted guarantee, and they may be relied on absolutely.

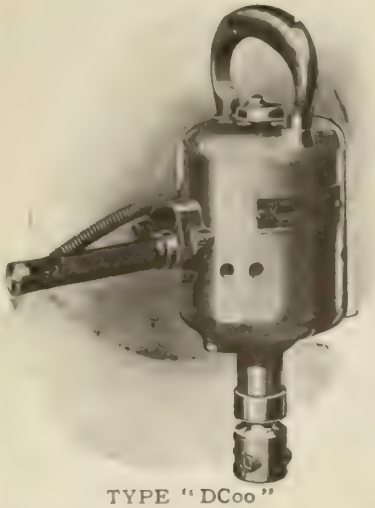
WRITE US FOR DETAILED SPECIFICATIONS AND PRICES.

New Haven Manufacturing Co.

NEW HAVEN, : : : : : : CONN., U.S.A.

Don't fail to mention "Canadian Machinery" in writing to advertisers.

"HARD SERVICE"



TYPE "DCoo"

Electrically Operated

Drills and Reamers

Built in 6 sizes. Scope 0 to 2 inches.

Why use others, air or electric, when "Hard Service" machines will give you the best service and the greatest output in the least time at the lowest cost?

"Hard Service" is synonymous with the latest and best in both electrical and mechanical development. Your ULTIMATE tools, if you want uniform satisfactory service, maximum production and minimum cost

Write for descriptive matter, information and prices.

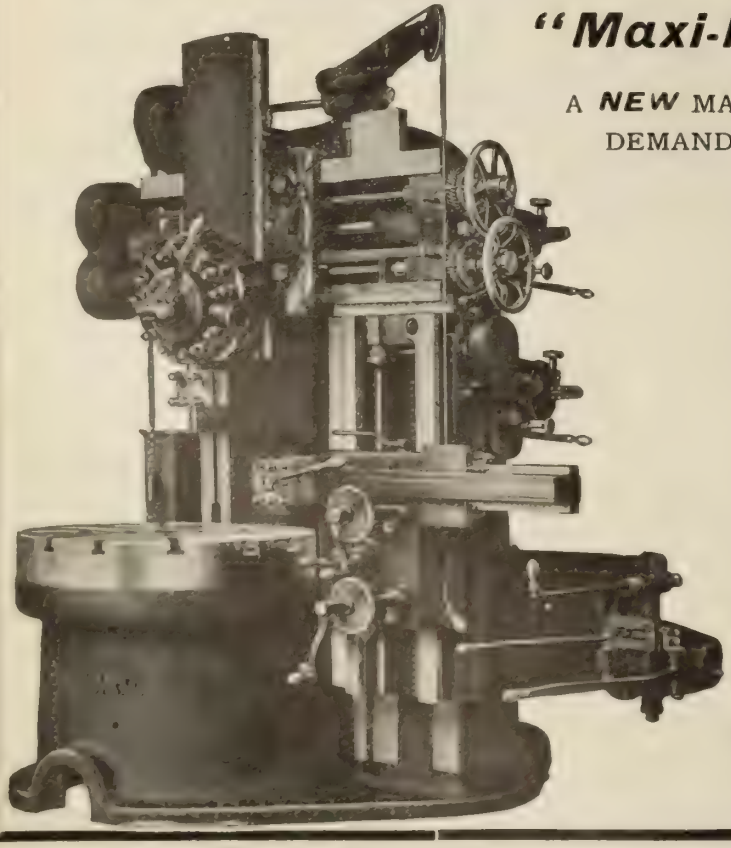
The Van Dorn & Dutton Company

General Offices and Factories: CLEVELAND, OHIO.

R. E. T. PRINGLE, Canadian Representative: Eastern Townships Bank Bldg., Montreal, Quebec.

The Bullard 42-inch Vertical Turret Lathe

"Maxi-Mill" Type



A ***NEW*** MACHINE TOOL DESIGNED TO MEET THE DEMANDS OF TO-DAY AND OF THE FUTURE.

To accomplish which, ***alloy steel gears,*** heat treated, have been employed throughout the drive, ***automatic forced feed lubrication*** of all driving parts has been applied and ***ample power*** has been provided. Close, ***rigid construction*** accompanied by ***extreme weight*** of parts, assures maximum cutting speeds and liberal feeds, and power control throughout makes operation a pleasure.

In all, 18,300 lbs. of labor-saving and highly productive machine tool.

Ask for pamphlet No. C-42, describing the many other distinctive features incident to this new machine.

The Bullard Machine Tool Co.

Bridgeport, Conn., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.



Edgar Allen & Co., Limited

Manufacturers of

TRAMWAY POINTS and CROSSINGS

Tramway Passing Places, Junctions, Depot Sidings, Lay Outs

Supplied complete with all Fittings ready for laying on the road.

OVER 20 YEARS' EXPERIENCE

Sole makers of

ALLEN'S IMPERIAL MANGANESE STEEL

Manager for Canada--THOMAS HAMPTON

330 ST. JAMES STREET : : MONTREAL

DOUBLE SERVICE FROM YOUR CAPITAL IN A "BARR"

Combined Drilling and Tapping Machine

Both Drilling and Tapping are done as well as on separate machines, and there is an economy of space, labor and handling. : : : :

Power feed, Lever feed and Tappers in any combination, two to seven spindles to a machine. :



H. G. BARR

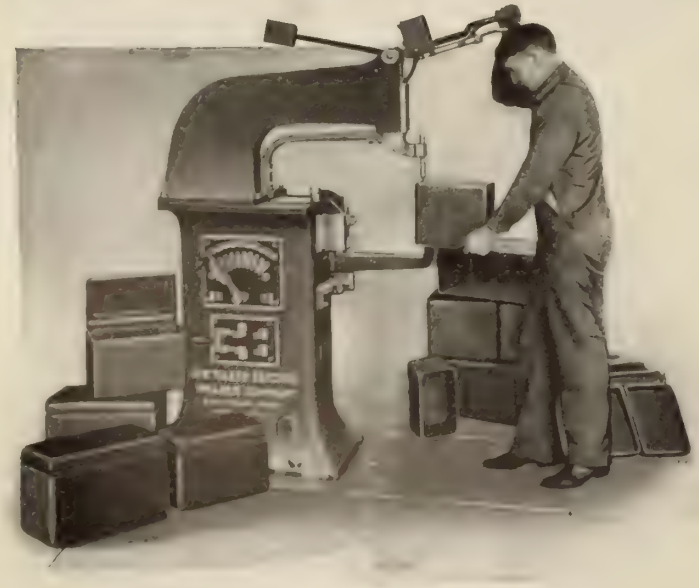
WORCESTER, - MASS., U.S.A.

Agents wanted for other territory. Orders received direct when no agent covers your town.

WILLIAMS & WILSON, Montreal, - Agents for Eastern Canada

NOT A RIVET USED

In Making These Sheet Steel Boxes. They are Electrically "Spot" Welded



That means a small spot the size of a rivet is fused (melted and run together) where the weld is made.

Costs less than riveting, holds better and is a neater job.

No holes to punch, no rivets to insert, just touch a switch—it's finished.

WE DON'T MAKE BOXES

Our specialty is building Electric Welding Machines for doing the work. Our catalog tells all about them—both Spot Welders and Butt Welders. Over twenty different sizes and types. Shall we mail it?

No License. No Lease. No Royalty.

The "Toledo" Electric Welder Co.

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

REPRESENTATIVES

L. F. McClernan
1243 Peoples Gas Bldg.
CHICAGO

L. F. McClernan
1417 Ford Bldg.
DETROIT

L. D. Rockwell
U.S. Express Bldg.
NEW YORK



ANNOUNCEMENT

OUR new plant at Montreal is thoroughly equipped for the production of screws, nuts, bolts and all kinds of special parts made from bars of brass, iron and steel.

YEARS of experience in building and operating Acme Automatic Multiple Spindle Screw Machines for the manufacture of high grade parts enables us to offer a first class product, good deliveries and attractive prices.

A LARGE assortment of Cap and Set Screws in "V" and U.S. Thread; also A.L.A.M. Standard Plain and Castellated Nuts carried in stock.

LET us quote on your samples and specifications for parts in quantities, or send for catalog of regular stock.

The National Acme Manufacturing Co.

MONTREAL, St. Elizabeth St. and G.T.R. NEW YORK, 77 White Street. BOSTON, 141 Milk Street. CHICAGO, 549 Washington Blvd. DETROIT, Candler Bldg.

WAREHOUSES—New York, 77 White St.; Chicago, 549 Washington Blvd
PLANTS—Cleveland, Ohio. Montreal, Canada.

Valley City No. 3

This Tool and Surface Grinder has an unequalled production range where quantities of key-fitting, punch, die and tool sharpening are concerned.

Base is cast solid to avoid vibration and permit high speed. Convenient and rigid knee and table operated by hand wheel, holds work solidly in any desired position.



Table, 11 x 20 inches, has a vertical travel of 12 ins. on the guides and may also be equipped with a reversible sliding table.

Floor space required, 28 x 20 inches. A very convenient all-around machine for general shop or tool room grinding.

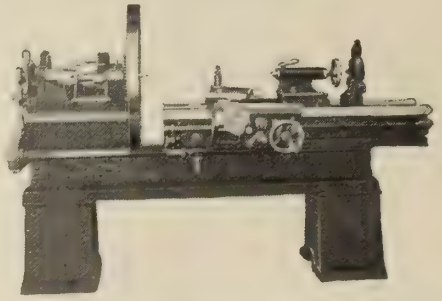
Send for catalog of grinding and polishing machinery.

Valley City Machine Works
GRAND RAPIDS, MICH.

EIGHT-FOOT CENTERS on an eight-foot bed.

TWENTY-EIGHT INCH SWING on a fourteen-inch lathe,

all for a little more than the price of a small lathe, and at HALF THE PRICE of a large lathe.



14 x 28 x 8 Extension Gap Lathe.

For large work the top bed is moved by power out along the base, opening the gap, making a large swing lathe with increased center distance. The overhanging carriage is supported by a bracket with adjustable gib, making a rigid design, capable of turning full swing diameters to the best possible advantage. The triple-geared face plate furnishes ample driving power.

Seven sizes of these we build, and all as good.

The new book is yours for the asking.

FAY & SCOTT
DEXTER, MAINE, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.



When Buyer and User Agree in claiming that the

NICHOLSON FILES

ARE SUPERIOR FILES

There must be foundation for their faith both in quality and price.

Nicholson Files are made from special steel made on formula suited to the special uses intended.

The shapes and cuttings are determined by nearly half a century's development.

NICHOLSON-MADE BRANDS
MANUFACTURED IN CANADA ARE

American, Arcade, Great Western, Globe, Eagle, McLellan, Kearney & Foot, J. B. Smith

ASK YOUR DEALER.

NICHOLSON FILE COMPANY

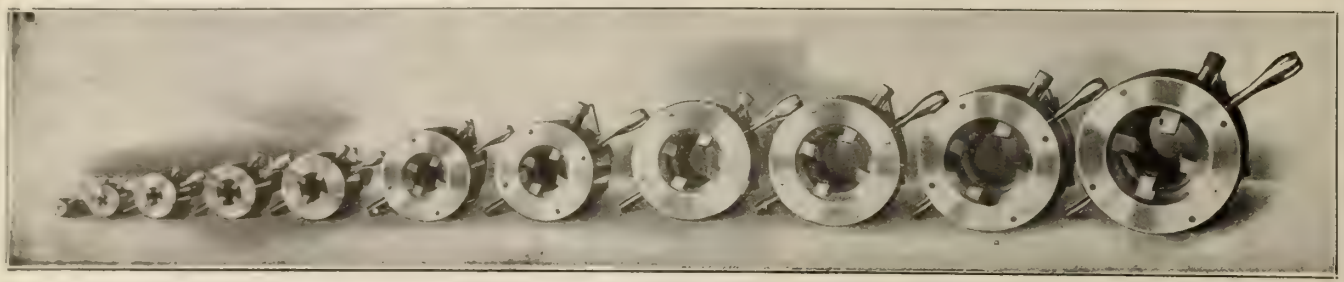
DOMINION WORKS PORT HOPE, ONT.

SOME PEOPLE THINK

it necessary to buy a special machine on which to cut coarse pitch Acme or square screw threads, but this is not a fact, for the

Geometric Style "D" Die Heads

when applied to a suitable Screw Machine or Turret Lathe, make the very best possible equipment for cutting any diameter, form or pitch of screw thread, and it does not tie up a lot of money, either, for the equipment.



Geometric Die Heads are a Big Saving at Small Cost. **Shall we tell you more about them?**

The Geometric Tool Company

New Haven, Conn., U.S.A.

Canadian Agents: WILLIAMS & WILSON, Montreal, Quebec ; A. R. WILLIAMS MACHINERY CO., Toronto, Ont.



L. S. STARRETT SAYS:

"If you find any better Tools than

STARRETT TOOLS

Buy them."

Send for Free Catalogue No. 173 of Fine Mechanical Tools.

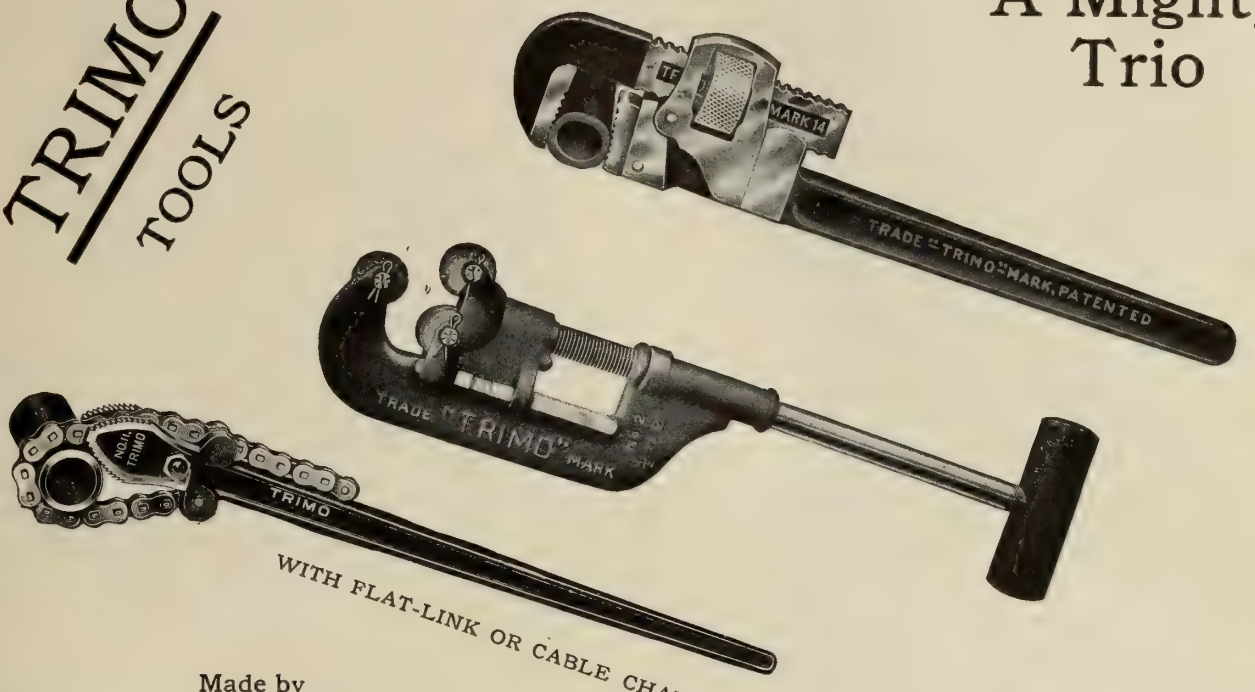
The L. S. Starrett Co., Athol, Mass. U. S. A.

STARRETT TOOLS

The advertiser would like to know where you saw his advertisement—tell him.

TRIMO TOOLS

A Mighty Trio



WITH FLAT-LINK OR CABLE CHAIN

Made by

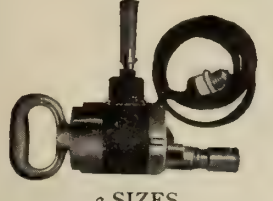
Trimont Mfg. Co.

Roxbury, Mass.

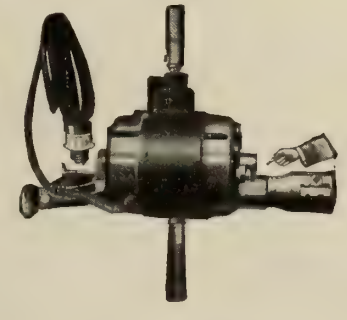
Send for Catalog No. 200

U. S. Electric Drills and Grinders

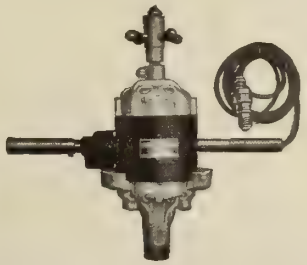
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



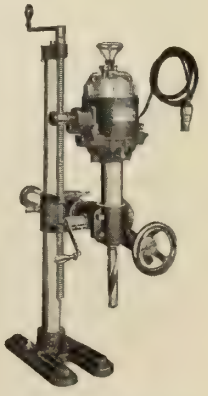
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

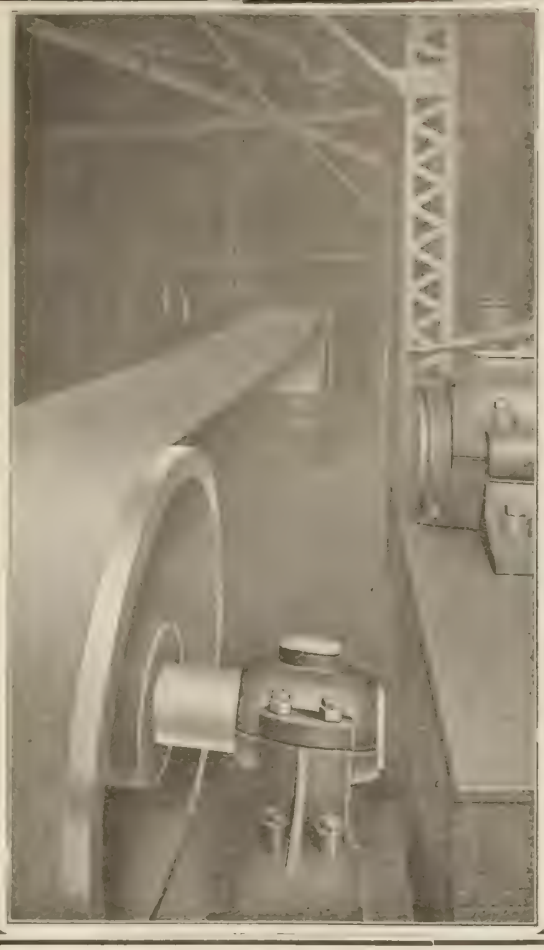
Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

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For Transmission and Conveying

EQUALLY GOOD IN **WET** OR **DRY** PLACES.

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Federal Engineering & Supplies, Limited

284 Yonge Street, Toronto

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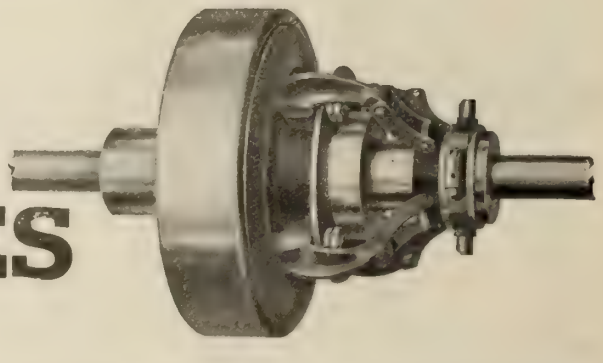
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Certainty is what a Manufacturer seeks in Everything.

The Manufacturer Who Will Install

"POSITIVE" CLUTCHES



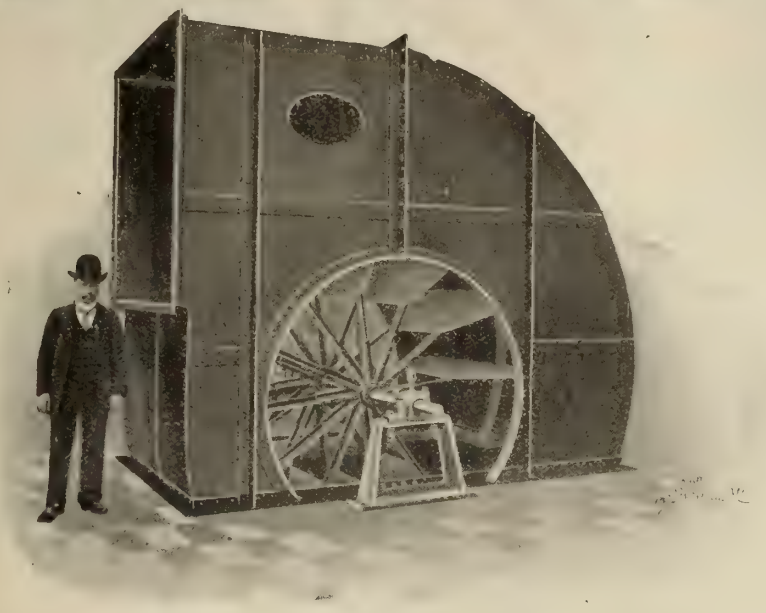
Has the satisfaction of knowing that he has bought a clutch which is absolutely reliable: being a simple Jaw Clutch which can be operated at any speed and under any load.

The Positive Clutch & Pulley Works, Limited

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CYCLONE FANS



The Fan illustrated was supplied to the Houses of Parliament, London.

Have just been accepted by the SOUTH AFRICAN GOVERNMENT for the VENTILATION of the new Parliament House. Also by the CAPETOWN CORPORATION for supplying INDUCED DRAUGHT to the boilers at the Generating Station.

The CYCLONE cannot fail to please because it absorbs so little power in comparison with other makes, and is so substantial.

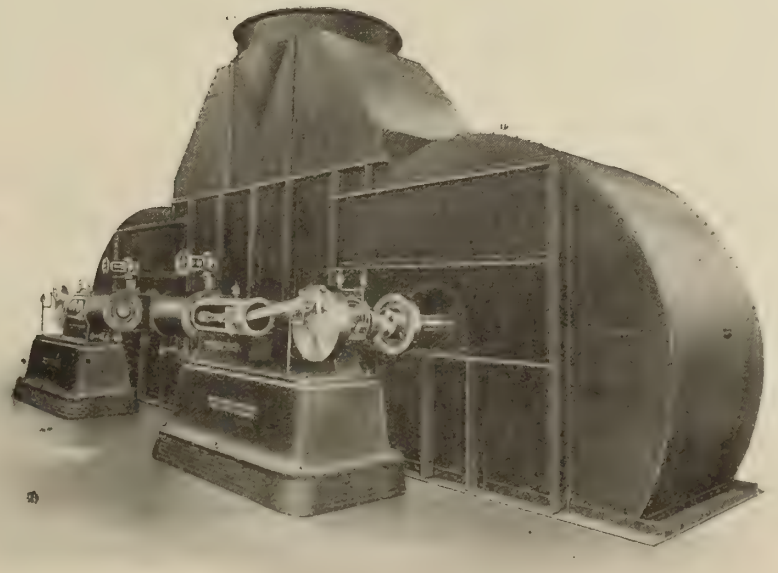
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Burn Cheap Fuel

With the Sheldon Mechanical Induced Draft System you can cut the cost of fuel in half, by utilizing a cheaper grade, or can secure better and almost smokeless combustion from the same grade of fuel that you are now using.

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SHELDONS LIMITED - GALT, ONTARIO



BOILERS
FROM STOCK

WE present below a list of our Stationary Return Tubular Boilers which we are prepared to furnish at once from stock.

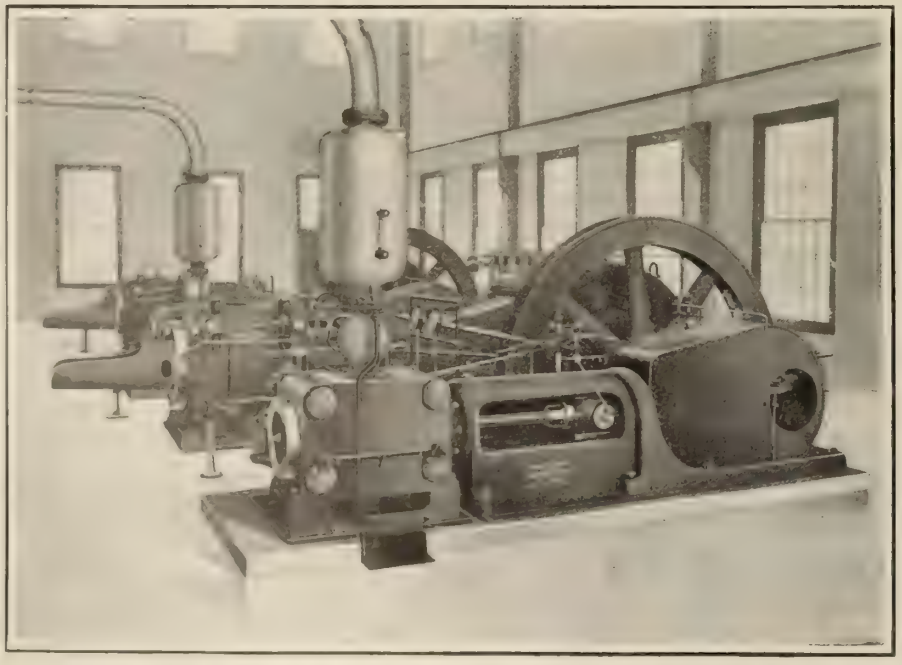
These are all new. All are built to standard specifications, are tested and inspected, and have the further guarantee of being "Waterous built."

3—40″ x 10′ for		125 lbs.	pressure.
1—48″ x 14′	"	138	" "
2—54″ x 14′	"	136	" "
6—66″ x 16′	"	160	" "
6—60″ x 14′	"	150	" "
4—72″ x 16′	"	144	" "
8—72″ x 18′	"	150	" "

We build Portable, Stationary and Marine Boilers. All sizes.

THE WATEROUS ENGINE WORKS CO., LTD.

BRANTFORD : : CANADA



Have you STOPPED to consider why CANADA'S LARGEST and BEST EQUIPPED POWER HOUSES are supplied with

Goldie Corliss Steam Engines?

The Reason is:—The installation of these are superintended by mechanical engineers who will have nothing but the best running and **most economical Engine.**

GOLDIE CORLISS STEAM ENGINES

have clearly demonstrated the fact that they are Superior to all other Engines of the same type.

Ask us for Catalogues, Specifications and any other Information you may require.

The Goldie & McCulloch Co., Limited, Galt, Ont., Can.

WESTERN BRANCH—248 McDermott Ave., Winnipeg, Man. QUEBEC—Ross & Greig, 412 St. James St., Montreal, Que.
MARITIME PROVINCES—13-15 Dock St., St. John, N.B. BRITISH COLUMBIA—Robt. Hamilton & Co., Vancouver, B.C.



Water Tower, Waterford, built for the Michigan Central Ry. Capacity, 100,000 gals.

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We build and erect

Water Towers,

Heavy Plate Work,

Steel Tanks of all Kinds.

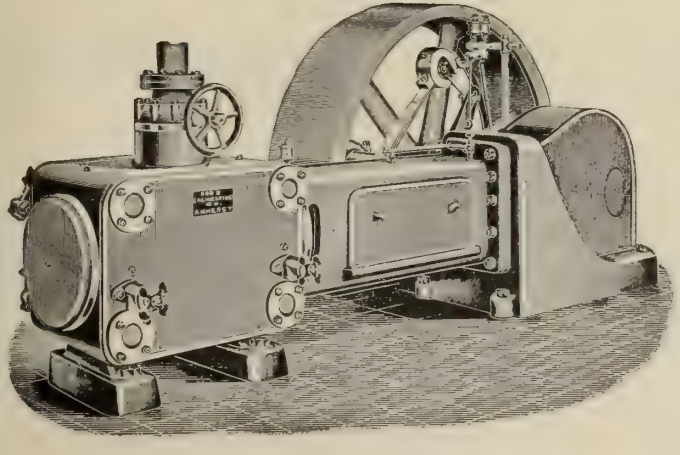
Let us give you prices.

The JOHN INGLIS COMPANY, LIMITED

ENGINEERS AND BOILERMAKERS

14 Strachan Avenue, - - - - TORONTO, CANADA

Robb Corliss Engines



Have the Armstrong-Corliss valve gear, which will operate at a higher speed than the ordinary releasing gear.

This valve gear does not depend on springs or dash pots for closing, and runs without noise.

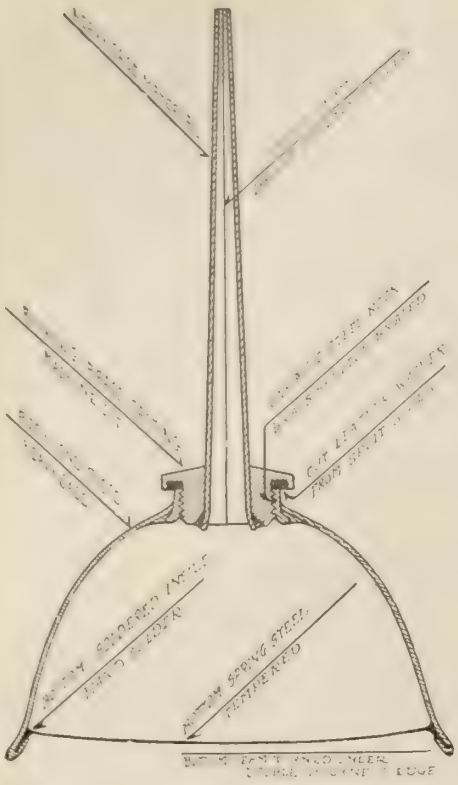
The wearing parts of the valve gear are enclosed in a casing and run in oil so that friction is reduced to a minimum.

Robb Engineering Co.
LIMITED

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DISTRICT OFFICES

Canadian Express Building, Montreal	R. W. Robb, Manager
Traders Bank Building, Toronto -	Wm. McKay, "
Union Bank Building, Winnipeg -	W. F. Porter, "
Grain Exchange Building, Calgary -	J. F. Porter, "



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1000 SUPERINTENDENTS, SHOP FOREMEN OR PURCHASING AGENTS

to write us on Company Stationery and secure one of our

No. 1704 Gem Brazed Steel Oilers

We desire to demon trate to them the superiority and durability of the oiler and the economy to everyone using them The oiler, for persons mentioned above, will be mailed FREE. This offer holds good until May 30th. If your dealer cannot supply you, after you receive and test the oiler, write us and we will refer you to some one who can We know this FREE oiler will secure your future patronage.

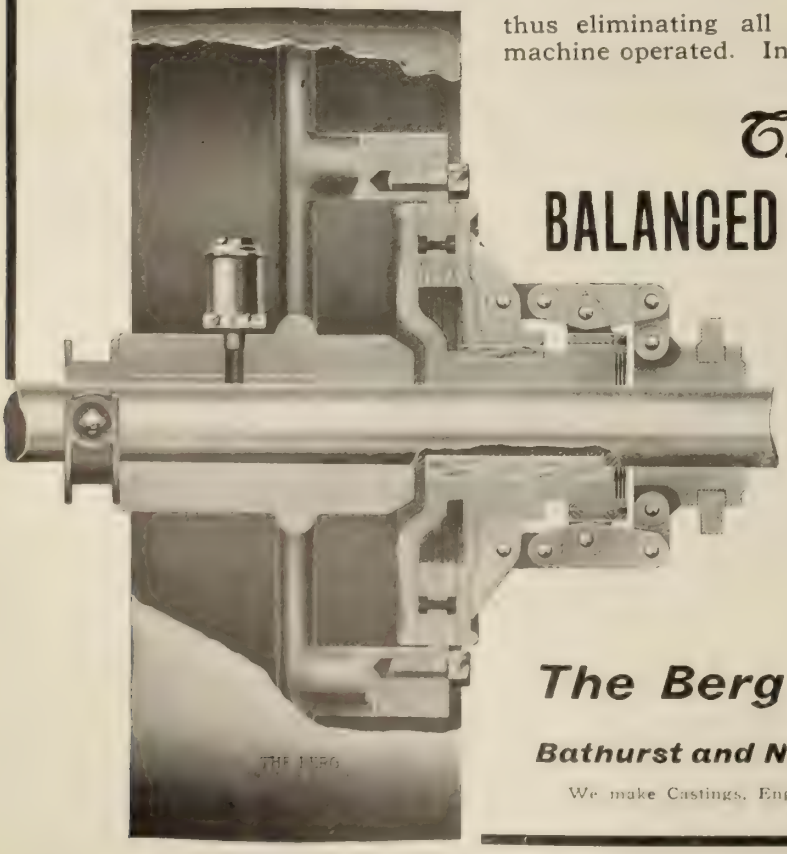
YOU CANNOT AFFORD TO BE WITHOUT THEM

Write for Catalog.

Gem Manufacturing Company

3253 Spruce Street - PITTSBURG, PA.

You Can Adjust This Clutch to Carry Any Load



thus eliminating all liability of overstrain or breakage of the machine operated. In the past eight years

The BERG BALANCED FRICTION CLUTCH PULLEY

has been used with the utmost satisfaction on over a thousand machines of various kinds.

It can be started as gradually as desired. Frictions are made of fibre—not wood, and the pulley is brass bushed.

We guarantee each clutch to carry its rated capacity with ease.

It will pay you to investigate this clutch as it is a trouble-killer and power-saver wherever it is installed. Write for circular and prices.

The Berg Machinery Mfg. Co.
Limited

Bathurst and Niagara Sts. ***Toronto, Ont.***

We make Castings, Engines, Boilers, Tanks, and Sheet Metal Work of all kinds. Mining and Brick Machinery.

The advertiser would like to know where you saw his advertisement—tell him.



A REMARKABLE TEST OF

MAGNOLIA

By the United States Government Using Water as a Lubricant

The "No. 2 Magnolia" mentioned in "TABLE E" contained the same proportions of tin, antimony and lead as the genuine "No. 1 Magnolia," but did not contain graphite nor was it treated by our special foundry process; however, it was made of virgin materials mixed in the ordinary way, and would class as a high grade babbitt.

TABLE E.—Giving results of combined ahead and reverse for friction test of Magnolia and "A" White Brass for each change of weight for 100 lbs. per square inch to 600 lbs. per square inch of projected area of bearing surface by increasing weight 100 lbs. per square inch at each change. **Lubricant: water.**

METALS.	Weight applied in lbs. per square inch.	Time in minutes.	Revolutions Total.	Revolutions Per minute.	Velocity or rubbing surface in feet per minute.	TEMPERATURE. Of air in room At beginning.	Of air in room Maximum.	Of air in room Mean.	Of air in room Mean. increase.	Of water bath. At beginning.	Of water bath. Maximum.	Of water bath. Mean.	Of water bath. Mean. increase.	Of test metal. At beginning.	Of test metal. Maximum.	Of test metal. Mean.	Of test metal. Mean. increase.	Co-efficient of friction.	Comparative values as anti-friction metals from the co-efficients.
Magnolia No. 1	200	60	58.585	488.21	511.25	60.0	62.0	60.25	0.25	61.6	90.0	73.0	12.00	60.0	84.0	69.58	9.58	0.00159375	12.4811
" No. 2			58.835	490.29	513.45	62.5	64.0	63.16	0.66	91.0	98.0	95.50	4.50	84.5	94.0	91.58	7.08	0.0049479	4.0202
A white brass			58.170	484.75	507.63	59.5	66.0	62.66	3.16	85.0	154.0	131.41	46.41	78.0	144.0	123.16	45.16	0.00198916	1.0000
Magnolia No. 1	300	60	59.025	491.87	515.09	62.5	63.0	61.41	−1.09	59.5	80.0	72.58	13.08	60.0	77.0	69.66	9.66	0.00080208	
"	400	60	59.345	494.54	517.88	64.5	66.0	65.58	1.08	69.0	90.0	81.24	12.24	68.0	86.0	78.4	10.40	0.00129166	
"	500	60	58.650	488.75	511.82	72.0	76.0	73.33	1.33	77.5	142.0	105.33	28.83	77.0	130.0	98.58	22.58	0.002427	
"	600	60	58.870	490.58	513.74	68.5	71.0	68.25	−0.25	78.0	140.0	97.08	19.08	76.5	124.0	92.60	16.16	0.00275	

A " White " Brass could be tested up to only 200 lbs. per square inch, as the machine would not turn beyond that weight.

The Testing Machine turned easily up to 600 lbs. per square inch with the genuine Magnolia No. 1.

It was not thought necessary to test the No. 2 metal beyond 200 lbs. per square inch. The Water Test shows the true intrinsic value of Magnolia Metal as compared with other metals. It also demonstrates that a metal may show relatively the same analysis as Magnolia and yet fall far short of giving equal results; it also shows the destructive effect of frictional heat on even a very hard metal like white brass.

It will be observed that the genuine Magnolia Metal (No. 1) proved to be twelve times superior anti-frictionally to white brass, and three times superior to the No. 2 or ordinary grade babbitt.

SOLD BY LEADING DEALERS EVERYWHERE OR BY

MAGNOLIA METAL CO.

No. 225 St. Ambroise Street, MONTREAL

New York Chicago

SPECIAL OFFER PRACTICAL ENGINEER POCKET BOOK, containing 680 pages, treating on over two thousand Engineering and Mechanical Subjects, brought up to date. We offer this valuable reference work at the very low price of 40c postage prepaid. Address Montreal office.

"DANGER"—"FIRE"

Every manufacturer recognizes the danger from fire consequent to the use of the ordinary Loose Pulley.

Ball Bearing Loose Pulleys eliminate: "All Danger from Fire."

99% of Attention.
95% of Lubrication.
100% of Dripping and Flying of Oil.
95% of Friction Loss.

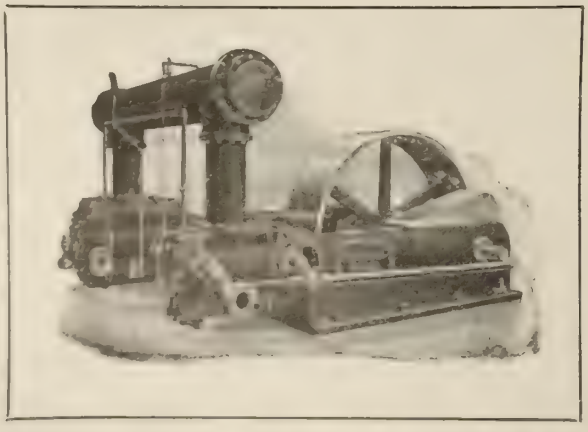
Price list and discounts furnished upon application.

The Chapman Double Ball Bearing Company of Canada, Limited

339 to 351 Sorauren Ave., - - - - Toronto

RAND COMPRESSORS

THE Air Compressor is one of the most important elements of the modern industrial plant. It is not an industrial extravagance, but a great labor and time-saving investment.



It is the basis of the safest, most economical and most versatile means of transmitting power for small tools. It is difficult to overestimate the importance of the use of small pneumatic labor-saving devices in the modern industry. They mean greater production, greater profits and lower labor costs.

IMPERIAL RIVETERS and CHIPPERS.

CANADIAN RAND CO., LIMITED

COMMERCIAL UNION BUILDING, MONTREAL

TORONTO, COBALT, WINNIPEG, LETHBRIDGE, ROSSLAND, VANCOUVER, HALIFAX

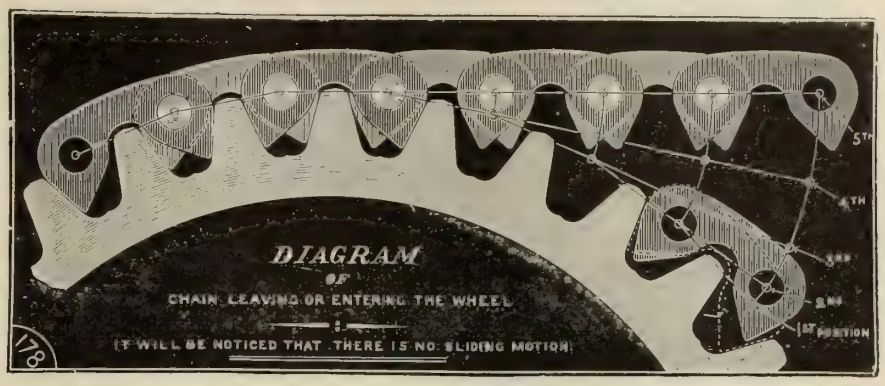
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RENOLD

Manchester, - - England

SILENT CHAINS

What Users Think



¼ to 1000 H.P. transmitted

Messrs. Jones & Glassco,
Montreal

Montreal, Feb. 8th, 1909

Renold Silent Chain Drive

Gentlemen,

In reply to your inquiry of January 30th. I may say that the Renold Silent Chain Drives we have installed are giving every satisfaction.

Our first drive was installed to replace a 12-inch belt which was giving us trouble on account of short centres; this chain has run continuously for four years without the slightest trouble.

Our second drive was installed on a mixing machine doing heavy duty and which had previously broken up two sets of spur gearing; this chain has run over three years with no sign of wear yet.

Our third drive was installed on a calendering machine after breaking two sets of helical gears, and this has been so successful that we are now installing two more similar drives,

I would be perfectly willing to make an appointment with any person genuinely interested and show him the drives in operation.

The above comes from one of the largest manufacturers in Montreal, and is signed by the Mechanical Superintendent. Up to the present (1911) these drives have not received repairs of any kind.

JONES & GLASSCO SOLE CANADIAN AGENTS MONTREAL

STEEL CASTINGS

By the TROPENAS CONVERTER PROCESS

We beg to announce that owing to the growth of our steel foundry business we are giving up the manufacture of grey iron castings, and in future by specializing hope to give still better satisfaction.

When new improvements at present under way are finished, we will have the most modern and best equipped steel foundry in Canada for the manufacture of steel castings up to 1,000 lbs. weight.

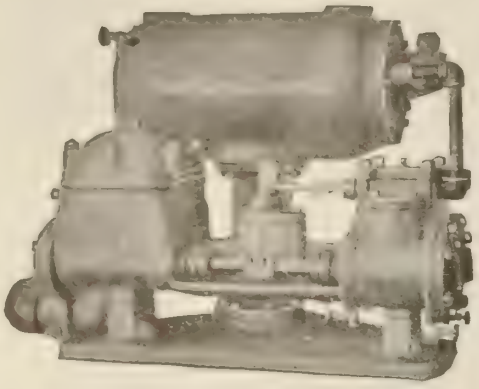
Pattern Work

Parker Foundry Company, Limited

27 Tanstey St., - - - - - MONTREAL

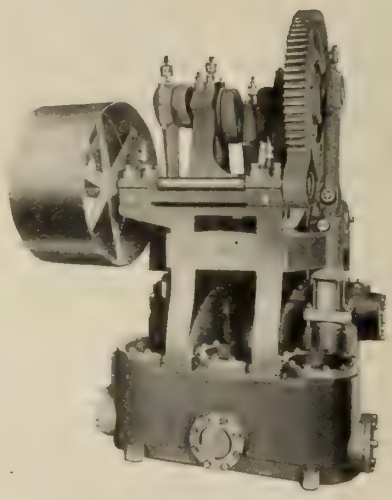
STEAM AND POWER PUMPS

OF EVERY DESCRIPTION

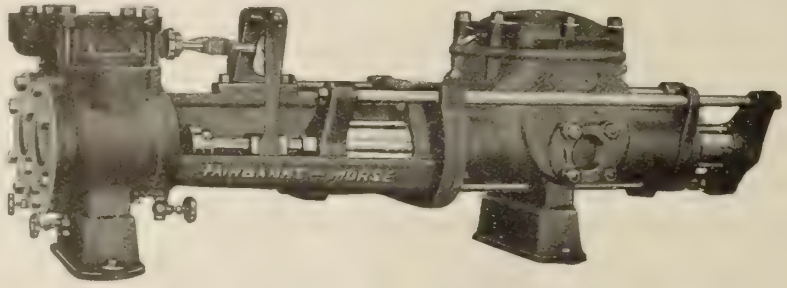


Duplex Automatic Feed Pump and Receiver.

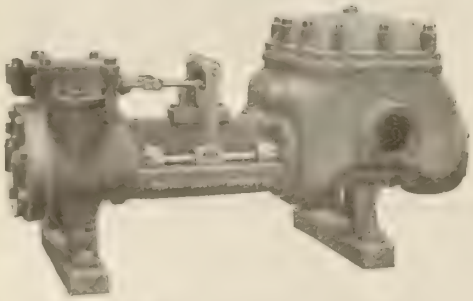
Profit by Our Experience



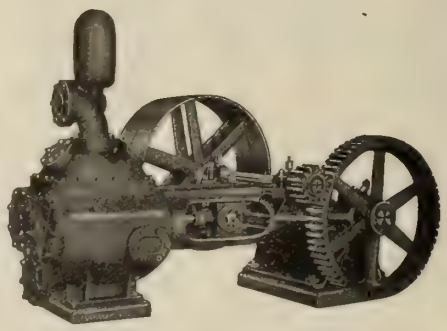
Triplex Power Pump.



Duplex Outside End Packed Plunger Pump



Fairbanks-Morse Duplex Piston Pattern Low Service or Tank Pump.



Fairbanks-Morse Duplex Power Pump.

Are you interested in a pump of any description, for any duty? We are manufacturers of, and selling agents for, a great variety of pumps, some of which are here represented. If you have not in mind the size and type of pump you require, we are prepared to figure upon your particular requirements and to suggest what would be most suitable for your work. In a word, we are at your service, and in order that we may make an intelligent recommendation, kindly give us full information as to your conditions and obtain the benefit of our expert opinion free.

The Canadian Fairbanks Co., Limited

Fairbanks Scales—Fairbanks-Morse Gas Engines—Safes and Vaults.

Montreal Toronto St. John, N.B. Winnipeg Saskatoon Calgary Vancouver

The advertiser would like to know where you saw his advertisement—tell him.

The Safeguarding of Machinery in Industrial Plants

The Importance of Safeguarding Machinery was Pointed out at a Recent Meeting of the American Society of Mechanical Engineers When John Calder gave a Paper Discussing the Nature and Incidence of Industrial Injury, its Prevalence and High Rate, and the Present General Desire for better Conditions of Safety. It Analyzes the Chief Causes of Injury as Revealed from a Study by the Author of a Large Number of Verified Casualties and Recommends Practicable Measures Calculated to Reduce the Present Numerous Fatalities and Injuries. It Discusses in Particular the Important Services Which the Mechanical Engineer, both as an Executive and Constructor, can Render in Exercising his Ingenuity to Avoid Industrial Accident. The Paper Contains a Number of Practical Safeguarding Illustrations from the Field of Machine Building, Equipment, Installation, Transmission Plant and Especially Dangerous Machines and Processes, and Concludes with Suggestions for Administrative and Remedial Precautions.

THE subject of accident prevention is now coming to the front on that wave of humanitarian consideration which is noticeable everywhere. On its educational and sentimental aspects mechanics, foremen, superintendents, managers and proprietors have had their interest awakened to some extent by the work being done by manufacturers of safeguards and by manufacturers generally realizing that every workman laid aside from work means a break in the organization, and hence a decreased efficiency in the shop.

The principles of safeguarding and safeworking in industry should be as much a part of the economic education of the young engineer and the future (and present) shop officials, as those of efficiency. The scientific study as a matter of course and the solution by the mechanical engineer of individual problems of safeguarding, supervision and instruction of employes as they arise in their daily routine will do more than all other existing agencies to bring about satisfactory results.

It is believed that, by proper supervision and precautions in all plants and

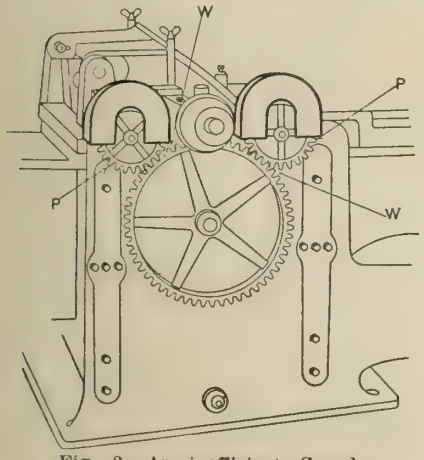


Fig. 2.—An inefficient Guard.

industrial processes and the cultivation of greater care by operatives, at least one-third of the present annual sacrifice of life and limb can be prevented.

The Cause of Accidents.

The word "accident" in relation to industry is not specifically defined by any statute, but it has the popular significance of any unforeseen and usually sudden occurrence which results in bodily injury to any person while present at the work place or even within the boundaries of the employer's premises. The injury, to be reportable as an accident,

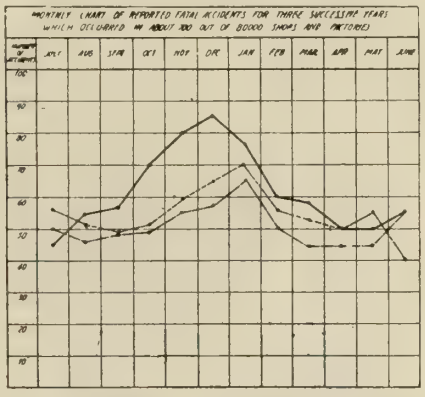


Fig. 1.—Influence of Daylight on Accidents.

need not arise out of or in connection with the employe's assigned duties. It is the fact of injury, not the cause, which generally makes an accident reportable under the labor laws to the civil authorities.

In analyzing many thousands of industrial accidents, the following have been found to be the chief causes: Ignorance, carelessness, unsuitable clothing, insufficient lighting, dirty and obstructed workplaces, defects of machinery and structures, and absence of safeguards. In current popular comment on the wastefulness of life and limb in our industrial regime little regard is paid to the facts underlying accident, but well considered action must be based solely on these of which some account follows:

In spite of ample facilities now afforded to all for the acquisition of some knowledge of mechanical principles, some superintendents, a number of foremen, many operatives and not a few managing owners of smaller plants, have been found to be grossly ignorant of the nature of the forces and mechanical arrangement which it is in their power either to control or to set free with resulting danger to themselves and others.

Sometimes combined with ignorance, sometimes sheer thoughtlessness, folly or horse play, carelessness by operatives stands highest as a cause of industrial accident from the results of which nothing external can do much to shield the worker and those whom he sometimes involves. It is the experience of the author that the American workman is easily first in taking foolish and wholly unnecessary chances with his life and limbs; chances which in no way add to his efficiency or his earnings. The maintenance of strict discipline in the shops, the adoption of salutary punitive measures and the firm elimination of the dangerous employe is all that can be done, in addition to a campaign of education throughout the plant.

Accident is caused at many machine parts which are necessarily exposed near the operator, and with which he would never come into dangerous contact but for unsuitable or neglected clothing. The ragged sleeve ends, loose ties and open jackets of untidy machinists have again and again been wound upon seemingly trivial parts in motion and through the powerful effect of coil

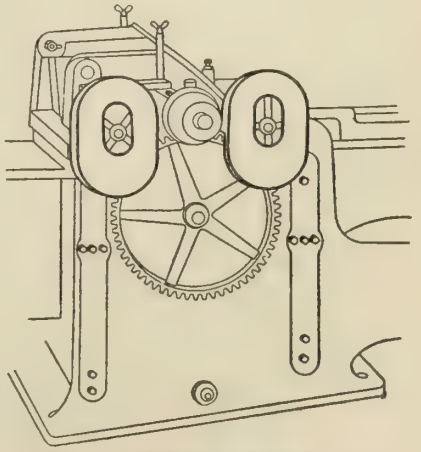


Fig. 3.—Properly Protected Gears.

friction have inflicted frightful and often fatal injuries.

Insufficient lighting is a cause of numerous accidents, particularly serious and fatal falls. A maximum of accidents occurs towards the close and beginning of each year, that is during November,

December and January, the months of minimum daylight. Fig. 1 shows the seasonal distribution for three successive years of about 700 deaths annually from industrial accidents, which were reported with other injuries from an area embracing 80,000 plants of varying extents.

The intensity of artificial lighting at the cutting point of tools, and on very limited machine tool or bench areas is

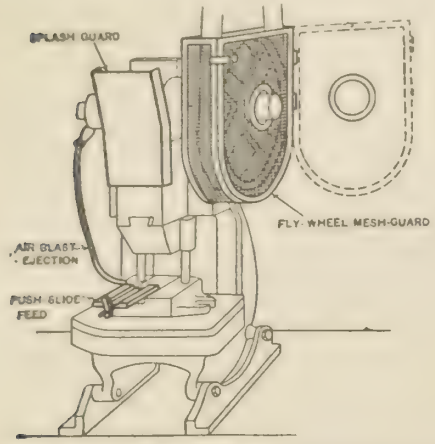


Fig. 4 Good Wire Screen Protection for Driving Wheel.

frequently far above actual requirements and a source of much physical discomfort, while all around the operator a semi-darkness prevails which has a blinding effect and is a source of danger.

The Possibilities of Safeguarding.

The absence of safeguards closely concerns the mechanical engineer, who holds the possibilities largely in his own hands. In many cases of injuries to operatives caused by the absence of a passible safeguard, it will be found that it has been removed, or rendered ineffective by the employe for lack of supervision in such matters or that protection has never been provided. Safeguarding absent at one machine is sometimes actually afforded elsewhere under the same roof and the accident is due to the operation of the principle that what is permitted to be everybody's or anybody's business is in daily life nobody's business. The safety engineering of no plant should be left to the haphazard initiative of a number of individuals.

Consideration of what the mechanical engineer can contribute to this end naturally falls into two divisions: (a) the efficient safeguarding which he may design as an integral part of the machine tools and other apparatus and (b) the safeguarding which he may later devise and supply as the mechanical engineer or executive of plants using power apparatus and other equipment capable of inflicting injury.

Machine Builder and Safeguards.

Numerous instances might be cited of the vague notion expressed in some current machine designs that anything which looks like a cover for a part of a machine necessarily constitutes in daily service an efficient safeguard; sometimes no regard is paid to the actual direction of rotation or to reversal of motion or to the necessity in using the tool for frequently removing a clumsy cover which is as likely as not to be left off permanently. The real points of danger in daily operation need to be studied before a satisfactory protection can be provided.

Punches and Presses.

Punch and press machinery probably ranks next to wood-working tools in frequency of accident, though usually the operative escapes with less serious injury. The mechanical engineer cannot be too careful in seeing that these tools are in good repair, particularly the actuating gears. Automatic roll-feeds, sub-presses, magazine, hopper, gravity

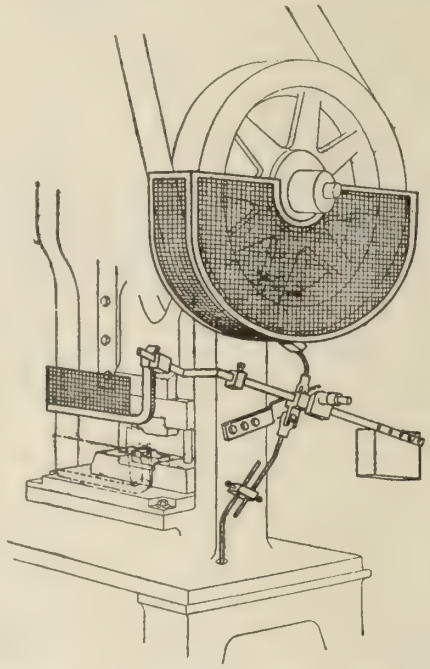


Fig. 5.—An Automatic Screen Guard for Press.

slides, and push slides feeds, have done a good deal to eliminate the dangers of feeding such presses by hand but much work already blanked must still be handled in this way in subsequent punching and pressing operations.

The increasing use of compressed air in mechanical industries permits of light pieces being blown off the die at the end of the operation by a cam-operated blast properly directed and timed, Fig. 41. The ordinary spring ejector serves the same purpose for heavier work. Yet there are many punches and presses running to-day without the efficient safeguards here illustrated and even where they are to be found the principles are not carried out consistently at all necessary places.

Fig. 4 is an example of a convenient flywheel guard, ordinarily locked in position, which the author arranged for a large series of small bench power presses worked by females. Provision is made in it for the tool setter having ready access for moving the flywheel by hand without detachment of the safeguard and resulting failure to replace it. The work in this machine is fed in by a push-slide and removed by a cam-actuated air blast. Fig. 5 shows a form of press guard, which is timed to descend upon the operator's finger, if in a position of danger, and secure their withdrawal before an accident occurs.

Emery wheels, grindstones and other abrasive tools when over-speeded or when strained or shocked while in motion within the limits prescribed by the maker, sometimes burst with great violence and spread death and serious injury in the path of their flight. Various methods for confining the wheel fragments to the machine casing or at least rendering their velocity harmless have been worked out and some of these are illustrated in Fig. 6. In all of them ample side clearance between the wheel and its casing is a primary requisite.

Durability and Identification of Safeguards.

Safeguards, where at all possible, should be constructed of metal to secure durability. Reinforced steel mesh work is preferred for all but the heaviest machinery. It is superior to guards of opaque material since it permits easy inspection without detaching the safeguard and interferes as little as possible with lighting conditions. In steel mills, foundries and heavy work plants of various descriptions, where the wear and tear of equipment is very great, no-

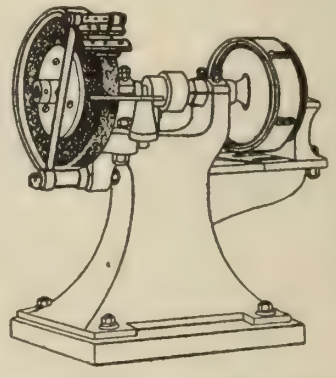


Fig. 6.—Safety Adjustable Hoods for Disc and Face Grinders.

thing but strong castings or steel plate work should be used for the majority of the guards. It is a good practice to have all safeguards readily distinguished by painting the body of them vermillion and the reinforced edges black. This allows executives to detect at a glance in going through the shops, a displaced or defective guard, such parts being often small in area, in inconspicuous places, and liable to be overlooked.

Twist Drill and Other Internal Cutting Tool Practice--II

By K. Campbell

Modern Shop Practice has Developed Various Types of Twist Drills, Reamers, Counter-Bores, Etc., Greatly Increasing the Capacity of the Machine Using These Small Tools. The Breakage of Tangs Formerly Caused a Great Loss, But This has Now Been Eliminated by Modern Practice. Part I Appeared in the March Issue and Dealt with Drilling in General, Some Types of Drills, Sharpening, Speeds, Shanks, Tangs, Etc. This Article Gives Some Additional Information on Drills, Drill Grinders, Etc., and also Deals with Reamers, Counterbores, Etc., the Information Being Secured from Manufacturers, from Various Technical Publications, etc., May Therefore be Relied upon as Accurate.

FOR accurate drilling the grinding is very important as was pointed out in the March issue. With a view to obtaining a true cutting edge, machines have been placed on the market to secure this desired end. Figs. 15 and 16 show the form given to the lip of a drill by the Sellers grinding machine. The axis y-y of the cone is inclined to the axis b-b of the drill, and also lies in a different plane as shown in Fig. 16, thus giving the cutting edge of the drill the necessary clearance, which increases towards the drill point as will be readily seen. The shape of the end of the drill-lip is part of the surface of a right cone, the axis of which will be coincident with the cone to be ground. If we assume the cone shown in Figs. 15 and 16 to be a grinding wheel revolving about the axis y-y with the drill point held against it as shown, the surface of one lip will evidently be ground to the desired conical form. To produce this shape of drill-lip in practice, it is not necessary to grind in the manner just described ; that is, by holding the drill against a conical abrading wheel, which revolves. An emery wheel having a flat surface, tangent to the theoretical cone required, will grind the same shape if the drill be made to swing about the axis of the cone.

Twist Drill Grinding Gauge.

In the March issue of Canadian Machinery a drill gauge was shown and its usefulness pointed out. In a recent issue of the American Machinist a simple gauge which may be easily made, was shown. The gauge is made of three pieces, two of which are riveted together and form the stock. See Fig. 17. The stock is machined at its upper end, prior to the riveting, to form a slide for the actual angle gage ; it also has a V machined along its straight side. The drill to be tested is laid in this V and the angle gage is then adjusted until its two angular edges make contact with the cutting edges of the drill, as it lies in the stock, then the drill is rotated a half turn ; if now, the two cutting edges make contact with the angular edges of the gage it will at once be obvious that its two cutting edges are of the same length as each other, and that the angle at which they are inclined to the axis of the drill is the same for one edge as for the other. It follows from this, that the point of the drill will be central with its axis.

High Speed Drill Speeds and Feeds.

Fig. 10 in the March issue for carbon drills. Fig. 18 and 19 are for high speed drills and are taken from a paper read before the Institution of Mechanical Engineers of Great Britain. Fig. 18 gives the r.p.m., feed per revolution, cu. ins. removed per min., and h.p. when

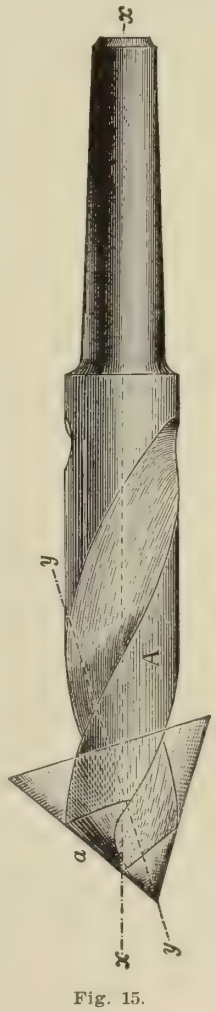


Fig. 15.

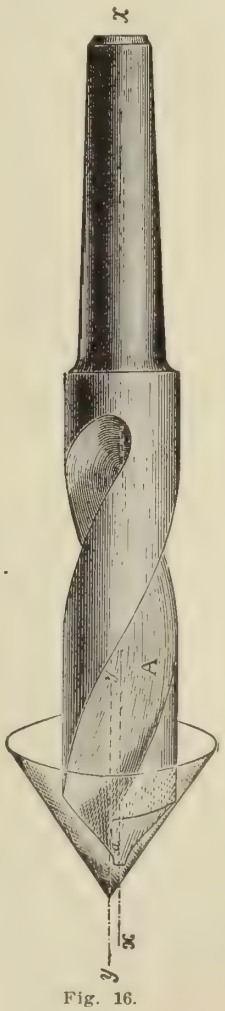


Fig. 16.

drilling cast iron with high speed steel drills. Fig. 19 shows the same items when drilling medium hard steel with high speed steel drills.

These two tables are recommended by drill makers for ordinary shop use. There is no general agreement among the makers of high speed twist drills as to what the cutting speed should be for ordinary shop practice. Some decrease the speed with the increase of diameter of drill, some recommend the reverse, but most makers advise a constant periphery speed throughout.

Special Drills.

Fig. 20 shows an end mill with centre cut. They are made to run right and left with a Morse taper shank. These end mills are useful where it is desired to cut into the work with the end of the mill and then move along as in cams, grooves, etc., as the teeth are sharp on the inside, and thus cut a path out from the first entering point. They are also useful in taking heavy cuts, especially in cast iron. They are made from $\frac{1}{2}$ in. to $1\frac{1}{2}$ ins. in diameter and to cut from 1 in. to $2\frac{1}{4}$ ins. in depth.

Fig. 21 shows some cored holes in flat cast iron plates to be reamed. For this it is best to use a short twist drill ground on the sides gradually tapering to the point. When reaming holes in structural shapes which are similar to Fig. 21 after punching, a three-fluted reaming drill is used.

Steel Reamers.

Reamers are now being made with high speed blades so that for this class of cutting tool the advantage of the increased work is obtained without the disadvantage of high cost. To get a solid reamer, high speed steel blades have been brazed to a soft body in the manner illustrated by stages in Fig. 22. A body of soft steel is grooved and fluted and bars of the required steel are then inserted in the grooves and secured by indenting the metal forming the adjacent front wall in a series of light indentations, a, by means of a punch, and forcing the blades into the bottom of the grooves, after such identations have been formed, by placing in a vise, or by other means. These indentations have the effect of forcing the metal into very close contact with the blade, retaining the blade in position by the frictional contact of the metal of the shank with the blade. Binding wires are then placed around the tool to retain the blades during the brazing and hardening oper-

ation. After the tool has been heated to the proper point for hardening the steel, and the whole has been treated with a proper flux and solder, it is cooled so as to secure the proper hardening of the steel and the setting of the spelter to form a bond between the blades and the head. When the tool is heated with the retaining wires around it the wires will become expanded, so that they do not serve to retain the blades very securely during the heating

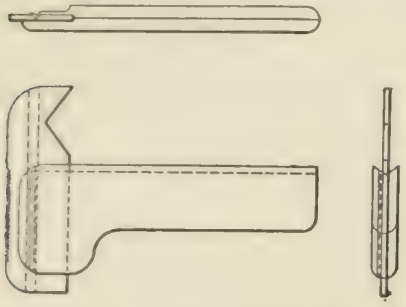


Fig. 17.—Twist Drill Grinding Gauge.

and brazing process; but when the tool is cooled the binding wires will be cooled first and will consequently sharply contract and force the blades to the



Fig. 20.—Left Hand End Mill.

bottom of their seats before the spelter sets. The tool is then cleaned and ground to finish.

Reamer Feeds and Speeds.

It is always advisable not to have any more material than possible to be removed by a reamer. For general work the amounts given in the following list taken from "Machinery," will give good results ranging in diameter from $\frac{1}{8}$ to $\frac{3}{8}$ inch. For reamers over $\frac{3}{8}$ inch diameter, a drill 1-64 inch less in diameter is

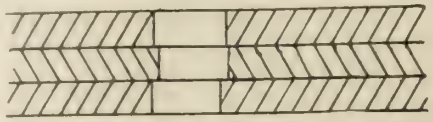


Fig. 21. Holes to be Reamed for Straight Bolting.

generally used, and this would leave from 0.012 to 0.015 inch to remove on the diameter, as it is obvious that a drill will cut slightly larger than its nominal size.

Diameter of reamer in inches.	Diameter of hole previous to reaming in inches.
$\frac{1}{8}$	0.120
3-16	0.182
$\frac{1}{4}$	0.242
5-16	0.302
$\frac{3}{8}$	0.368

There are various reasons for the inefficient working of a reamer, some of which are the following:

1. Chattering, which results when the teeth are evenly spaced or of an equal number.

2. Chips clinging to the teeth, which action results when high periphery velocities are used and insufficient clearance given.

3. Expanding and contracting of the hole which is caused by too great a feed and insufficient clearance on the cutting edges.

4. Enlarged and tapered hole due to holding the reamer rigid instead of floating.

The following is a table of feeds taken from "Machinery" and is for

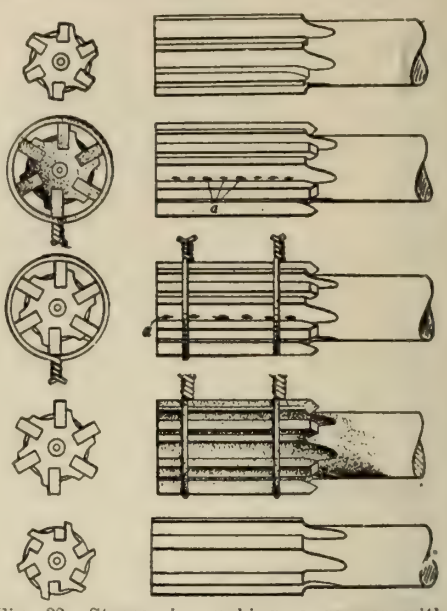


Fig. 22.—Stages in making a reamer with brazed high-speed steel blades.

reamers made from high-speed and carbon steel.

Diameter of Reamer in inches	Brass Rod Feed per revolution	Machine Steel Feed per revolution
$\frac{1}{8}$	0.007	0.004
3-16	0.008	0.004
$\frac{1}{4}$	0.009	0.005
5-16	0.010	0.006
$\frac{3}{8}$	0.011	0.007
7-16	0.012	0.008
$\frac{1}{2}$	0.013	0.009
9-16	0.014	0.010
$\frac{5}{8}$	0.015	0.011
11-16	0.016	0.012
$\frac{3}{4}$	0.017	0.013
13-16	0.018	0.014
$\frac{7}{8}$	0.020	0.015

1 Diameter of Drill in Inches	2 Revolutions per Minute $N = \frac{12 \times 48}{\pi d}$	3 Feed in Inches per Revolution of Drill $f = \frac{d^{\frac{1}{2}}}{84}$	4 Cubic Inches removed per Minute $1.715\,d^{\frac{3}{4}}$	5 Cutting Horse-power $1.16\,d$	6 Feeding Horse-power $\frac{d^{\frac{1}{2}}}{142}$	7 Total Horse-power	8 Horse-power per Cubic Inch of Metal removed per Minute
0.25	735	0.0075	0.27	0.29	0.005	0.295	1.092
0.375	490	0.0086	0.462	0.435	0.0055	0.4405	0.954
0.5	368	0.0094	0.682	0.58	0.0059	0.586	0.862
0.75	245	0.0109	1.17	0.87	0.0066	0.8766	0.748
1 0	184	0.0119	1.715	1.16	0.007	1.167	0.681
1.25	147	0.0129	2.32	1.45	0.0073	1.457	0.628
1.5	122	0.0136	2.92	1.74	0.0078	1.748	0.598
1.75	105	0.0144	3.63	2.03	0.0081	2.038	0.563
2.0	92	0.0150	4.32	2.32	0.0084	2.328	0.539
2.25	81.7	0.0156	5.05	2.61	0.0086	2.619	0.519
2.5	73.5	0.0162	5.82	2.9	0.0089	2.909	0.500
2.75	66.75	0.0167	6.6	3.19	0.0091	3.199	0.486
3 0	61.3	0.0172	7.4	3.48	0.0093	3.489	0.472
3.25	56.5	0.0176	8.22	3.77	0.0095	3.78	0.46
3.5	52.5	0.0181	9.05	4.06	0.0096	4.07	0.45
3.75	49	0.0185	10.0	4.35	0.0098	4.36	0.436
4.0	46	0.0190	10.8	4.64	0.00995	4.65	0.431

Fig. 18.—R.P.M., feed per revolution, cu. ins. removed per minute, and h.p. when drilling cast iron with high-speed steel drills.

1 Diameter of Drill, in Inches	2 Revolutions per Minute $N = \frac{12 \times 60}{\pi d}$	3 Feed in Inches per Revolution $f = \frac{d^{\frac{1}{2}}}{100}$	4 Cubic Inches removed per Minute $1.8\,d^{\frac{3}{4}}$	5 Cutting Horse-power $2.85\,d$	6 Feeding Horse-power $\frac{d^{\frac{1}{2}}}{77}$	7 Total Horse-power	8 Horse-power per Cubic Inch of Metal removed per Minute
0.25	920	0.0063	0.284	0.712	0.0092	0.721	2.54
0.375	614	0.0072	0.485	1.068	0.0102	1.078	2.22
0.5	460	0.00795	0.716	1.425	0.0109	1.426	1.99
0.75	306	0.0091	1.23	2.14	0.0121	2.152	1.75
1.0	230	0.01	1.8	2.85	0.013	2.863	1.59
1.25	184	0.0108	2.44	3.56	0.0138	3.574	1.47
1.5	153	0.0114	3.08	4.27	0.0145	4.285	1.39
1.75	131	0.0121	3.81	4.99	0.015	5.005	1.31
2.0	115	0.0126	4.54	5.7	0.0155	5.715	1.26
2.25	102	0.0131	5.3	6.42	0.0159	6.436	1.21
2.5	92	0.0136	6.12	7.12	0.0163	7.136	1.165
2.75	83.5	0.014	6.92	7.84	0.0167	7.857	1.135
3.0	76.5	0.0144	7.76	8.55	0.0171	8.567	1.105
3.25	70.5	0.0148	8.66	9.25	0.0175	9.267	1.07
3.5	65.6	0.0151	9.5	9.98	0.0178	9.998	1.05
3.75	61.25	0.0155	10.48	10.7	0.0181	10.718	1.024
4.0	57.5	0.0158	11.4	11.4	0.0184	11.42	1.0

Fig. 19.—R.P.M., feed per revolution, cu. ins., removed per minute and h.p. when drilling medium hard steel with high-speed steel drills.

Counterbores.

Dealing with counterbores, Douglas T. Hamilton writes that the surface speed at which a counterbore can be worked is slightly less than the surface speed used for drilling. The surface speeds given below are recommended for counterbores made from carbon and high speed steel.

Speeds From Counterbores Made From Carbon Steel.

Material	Surface speed in feet per minute
Brass (ordinary quality) ...	150-160
Gun screw iron	50-60
Norway iron and machine steel	40-50
Drill rod and tool steel	30-35

Speeds for Counterbores Made From High-speed Steel.

Material	Surface speed in feet per minute
Brass (ordinary quality)	180-200
Gun screw iron	80-90
Norway iron and machine steel	70-80
Drill rod and tool steel	45-50

The rate of feed at which the counterbore should be operated, depends on the nature of the work, to what depth it must penetrate, material being cut, number of cutting edges, etc., and there is no definite rule as to the exact feed to use.

INDUSTRIAL TRAINING IN ONTARIO.

At the recent session of the Ontario Legislature Dr. Pyne, introduced a bill which allows any urban school board to establish industrial schools, special industrial schools, technical high schools, co-operative and industrial schools, schools for instruction in fine and applied arts, industrial and technical and evening art schools. The regulations for the schools are to be provided by the Department of Education in the same way as in the case of a High school, and, subject to those regulations, the minister is to apportion all sums of money appropriated by the Legislature for the establishment and maintenance of such schools. The high school grant at present is apportioned according to the number of pupils, the equipment, and the qualifications of the teachers.

General industrial schools are those in which to the regular course there are added special classes calculated to prepare pupils for industrial life. Special industrial schools are those providing instruction in theoretical and practical work of particular trades carried on in the district where the school is situated. Co-operative schools are those in which an apprenticeship system is combined with the school course.

It is provided in the bill that every technical school, whether at present in operation or established hereafter, is to be under the management of a committee of twelve, six from the Board of Education, three persons not members of that board who are engaged as employes in manufacturing or other industries carried on in the district, and three employers of labor. This is to be known as the Advisory Industrial Committee. Where there is more than one school in the district there may be one or more committees, as the board desires. The committee is to be appointed by the Board of Education, on nomination of the chairman. This committee, subject to the Minister of Education and the Board of Education, will have power to provide buildings for industrial classes, to establish classes in other school buildings and to prescribe the course of study. The committee will also have power to engage teachers, fix their salaries, to asrange the finances of the school, and to do anything else necessary for its maintenance.

The Department of Education, by regulation will provide for the qualification of teachers, the course of study, the character of school sites and equipment, and the maximum and minimum fees which may be charged.

The Development of the Bertram Convertible Planer

The Designing of a Planer Body to Which Any Attachment Such as Right Angle or Parallel belt Drive or Motor Drive May be Applied, Means a Great Economy to the User Who Has Specified a Certain Drive. A Delivery May be Made Practically at Once Where Formerly Several Weeks Elapsed Between the Ordering and the Delivery of the Planer.

OF the long list of machine tools probably the planer has given more trouble to designer and user than any other machines. It was designed for one drive and a user had to accommodate himself to that drive whether it suited his shop or not. Later when devices and driving mechanisms were designed a user could get what he wanted if he waited long enough on delivery. This was often annoying for he wished to make immediate use of the planer.

The latest development in the design of a metal working planing machine, however, is a radical departure from the early system. The John Bertram & Sons Co., Dundas, Ont., have designed a planing machine body to which right angle belt, parallel belt or motor drive may be attached according to the specifications. The planer bodies and the various drives are manufactured for stock so that when an order for a planer is received, the necessary equipment is fastened to the standard body, and it is shipped complete in a few hours or a day or two at most, where previously several weeks elapsed to the great annoyance of the buyer.

Four Belt Right-Angle Drive.

Fig. 1 shows a 36 in. x 36 in. heavy type iron planing machine with four belt right angle drive. It admits 37 ins. between the housing and 37 ins. under the crossrail. The standard length of the table is 10 ft. independent of pockets.

There are four cutting heads, two on the crossrail and a side head on each standard. The heads on the crossrail have swivelling saddles and independent cross, down and angular feeds.

Power is transmitted to the table through a train of accurately cut gears. The crossrail is raised and lowered by power.

The table is 33 ins. wide and has three T slots the entire length and six rows of holes for securing the work. The V's have a bearing surface of 5½ ins. each and are 20 ins. from centre to centre, fitted with oil pockets for lubricating the table. The bed of the planer is 20 ins. deep and 26 ins. through the body, and the uprights have a width of face of 8¼ ins.

The planer is equipped with Bertram patent four belt drive. The driving pulleys are 26 ins. in diameter for 2½ in. belts giving the same pull as one 5 in. driving belt and one 5 in. return belt but quicker reverse. The reverse pulleys are 20 in. diameter using the same belt width.

Fig. 2 shows a rear view of 36 in. x 36 in. iron planer with four heads, driven through countershaft with right angle new type four belt drive.

The V-angle of the planer is flattened and the inside lip takes up the side shock thus preventing the planer surface plate being pushed out of the V's.

Feed Arrangement.

The feed arrangement is shown in Fig. 3. By a reference to this illustration it will be seen that studs fit in slide that fits in T slots. Tools can therefore come

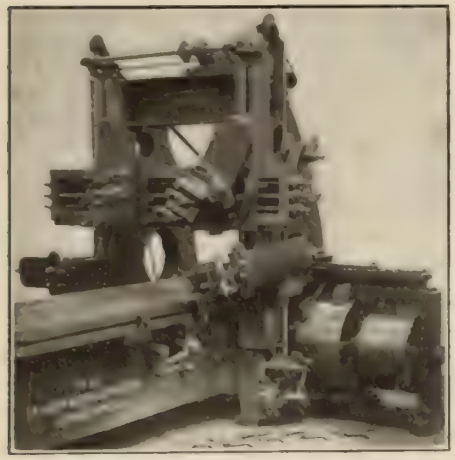


Fig. 1.—Front View, Four Wheel Right Angle Drive.

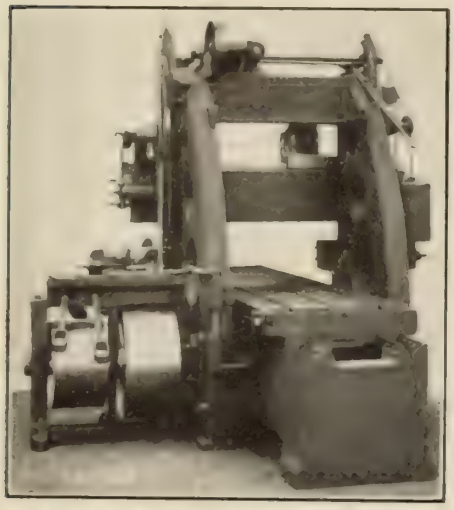


Fig. 2.—Back View, Four Wheel Right Angle Drive.

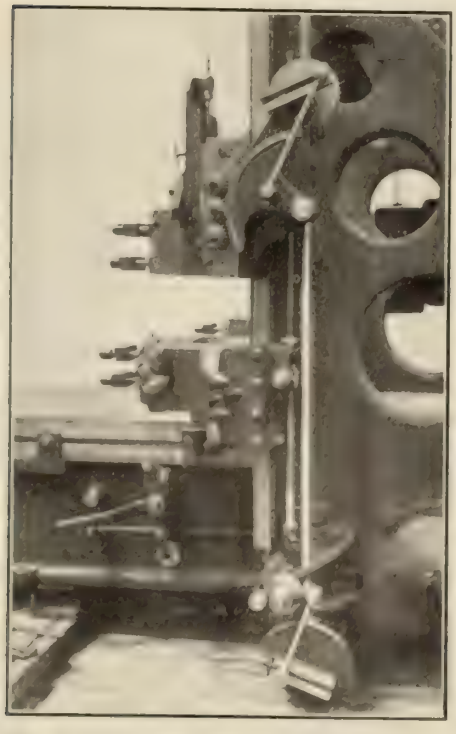


Fig. 3.—Feed Arrangement, Bertram Convertible Planer

together and are right and left. This is a new and good feature on Bertram planers.

Parallel Drive.

By changing the attachment the planer may be converted into a parallel drive. Fig. 4 is a front view of a 36 in. x 36 in. iron planer with four cutting heads, belt driven through countershaft, with parallel new type four belt drive. The gears which run in oil, are covering thus effectively preventing any accident from this part of the mechanism.

Fig. 5 shows a rear view of a 36 in. x 36 in. iron planer with four cutting

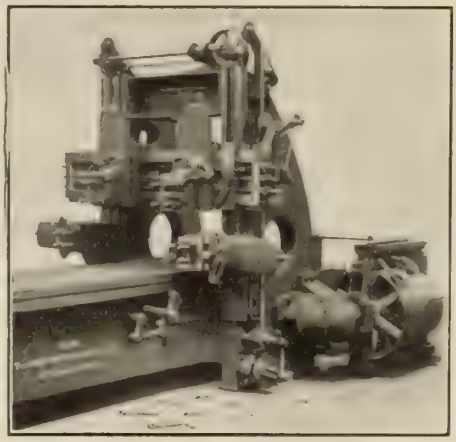


Fig. 4.—Front View Four Belt Parallel Drive.

heads, belt driven through a countershaft, with parallel new type four belt drive.

Motor Drive.

By the addition of a casting to the top of the standards, the planer may be equipped for motor drive. Fig. 6 shows a 36 in. x 36 in. iron planer with right angle drive by motor. To operate the planer a 15 h.p. constant speed motor running at 1200 r.p.m. is required.

A rear view of this planer equipped for motor drive is shown in Fig. 7.

At the annual meeting of the B. Greening Wire Co., Hamilton, N. S. Braden of the Canadian Westinghouse was elected a director.

George J. Duffey, formerly master mechanic at the Michigan Central Railway shops in St. Thomas, has been appointed master mechanic of the Lake Erie & Western Railway, with headquarters at Lima, Ohio, succeeding F. H. Regan, resigned.

J. Hay, of London, has been appointed locomotive foreman at the Sarnia tunnel, G. T. R., in place of W. H. Towne, resigned. Mr. Hay's place is taken by J. R. Leckie, of Palmerston. J. A. Waldron, machinist at Lindsay, has been appointed G. T. R. locomotive foreman at Palmerston.

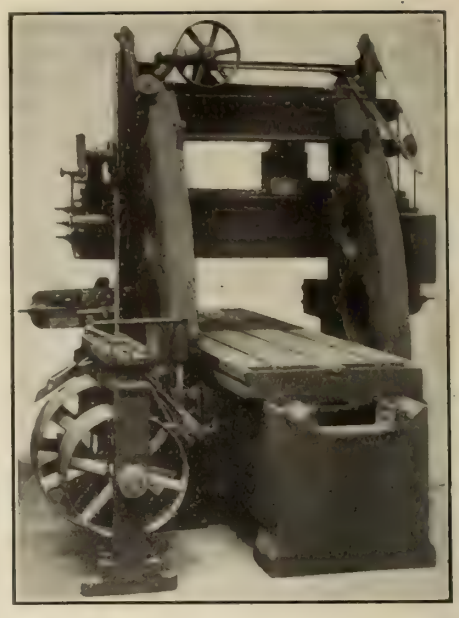


Fig. 5.—Back View, Four Belt Parallel Drive.

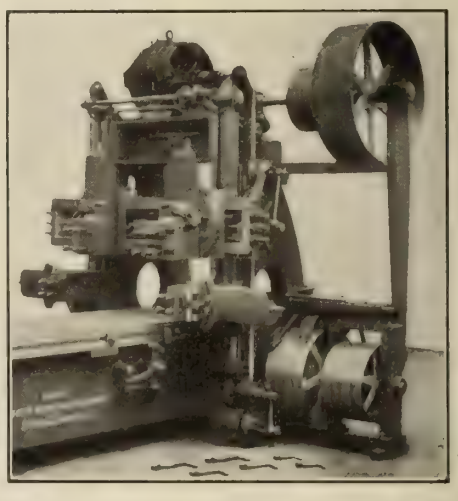


Fig. 6.—Front View, Right Angle Drive by Motor.

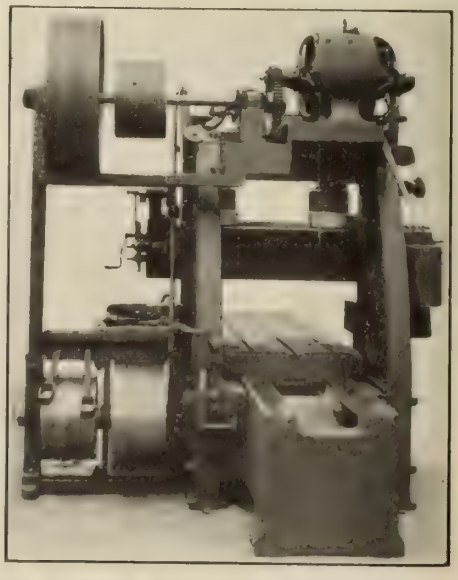


Fig. 7.—Back View, Right Angle Drive by Motor.

Is Factory Location Immaterial, If Product Unexcelled?

By Penstock

Someone Has Given Expression to the Statement that "if a Man Can Write a Better Book, Preach a better Sermon or Make a Better Mouse Trap Than His Neighbor, Although he Build his House in the Woods, The World will Make a Beaten Path to His Door." We are Rather Doubtful of the World Becoming so Demonstrative.

IF the preamble be true, reformation involving revolution in our civilization should be immediately consummated, for our upbringing, education, business training, social and recreative methods and pursuits are one and all more or less at variance with the expressed eventuality.

Contrary to Reason and Intelligence.

Is it, however, true to fact? Our answer that it is not, admits of no possibility of serious questioning, constituted as we find ourselves. The writing of a better book, whatever that may mean, by a man who elects to bury himself in the bush, is together with his book considered of infinitely less moment than a remedy for overcrowded street cars. For one thing he appeals to a much smaller community, and for another he and his book are less of the nature of a public utility and necessity.

The preaching of a better sermon by a man in the city crowd, and its response, is surely indictment enough of the ridiculousness of its efficacy in starting a trek to the woods.

Forgetting for the moment that a large proportion of our fellows even in Christian countries have ceased to be enamoured with sermons of any quality, it seems highly improbable that the "call of the wild" would appeal to the wearers of silk hats, Prince Albert coats, dressmaking and millinery creations as effectively as religious appearance in what is known as a fashionable city church with a hum-drum preacher.

The discovery of gold, silver or other precious metal precipitates a rush to the field. Did it ever occur to you how microscopic is the percentage entrapped in its lure?

The majority of us theorize that the doctor should come to his patient, and in actual practice in every condition or circumstance he eventually does. With his coming a cure is made more certain; of the ultimate output of the mine, people several thousand miles away participate to the largest extent; of sermons and books, comfort and leisure in which to listen and digest are elementary considerations of sound philosophy.

The Manufacturing View.

The mouse trap feature brings us into manufacturing, and there as in these other spheres, the world does not see warranty for making a beaten path to a factory door.

We live in a progressive age; the mouse trap in the limelight to-day, may be junk to-morrow even where mice are a nuisance. What hope then is there for the backwoods manufacturer of such a commodity?

An army dare not move too far from its supplies base else its effectiveness as a fighting and conquering machine will be seriously impaired. The manufacturer for the same reason may not locate his factory just where personal vanity in his fleeting achievement of producing an unsurpassed utility, may dictate. A stern law of economics over-rules and penalizes his imprudence of its non-observance should he take any such step.

Sufficient has been said to show the utter worthlessness of a too literal application of the preamble, and confirms our pre-determined conclusion that "factory location is material, irrespective of superlative product."

Produce a Missionary.

Having so satisfied ourselves, does superior and effective location then, backed by the best product, warrant the assumption that the world will now beat paths from its circumference to our centre af effort? We trow not. The world as generally known, treats with a generous degree of studied indifference, most of the happenings and innovations that it meets accidentally or otherwise, as it gets around. To make it take notice, arrest and hold its attention requires personally persuasive, sympathetic and systematic effort additional.

The manufacturer must make beaten paths radiate from his centre to all points of the world's surface and circumference, that his product is designed to reach. By display, mail, representation (local or itinerant), and advertising, must he "ancient mariner like" arrest and deliver his message to those he reckons as being needful of his service.

Sitting at his desk will not avail unless he is unceasingly regulating and disseminating realistic information of what he manufactures and sells.

Variety of Appeal Necessary.

All manner of ingenuity must be displayed as all manner of being has to be approached. What appeals to one by sight may be unseen by another, and it is a matter of common knowledge that this blindness is widespread.

One man sees in the completed machine, only the skilled designer and mechanic; another man sees a tool by which he can produce a cheaper and better grade of flour it may be.

The field to be tapped is so complex that the methods already referred to are all necessary to a lesser or greater extent.

Sincere Effective Advertising.

Manufacturers are fully realizing this demand to-day, and are backing it up by sincerity of statement. In this they are ably supported by trade journals.

Advertising in these to-day is not a catch penny question. The page of such a paper is an equally well dressed window to that of a departmental store, gives point to every special feature and appeals to the purse like bargain day.

We are convinced that clean advertising concentrated as regards mediums used and extended in quantity, carries the palm as the pioneer in beating the path out from your factory door, and the eliminator of that hardship and inconvenience which the world sees in its suggested initiative, and from which it shrinks.

Effective and systematic advertising is more than half the battle in securing your market, and followed up by direct personal assurance from and by you in your prospective customer's sanctum instead of in yours, cannot fail to win out entirely.

Every doctrine of political economy and philosophy warrants us in stating that present methods do conspire to results, and that a much distorted conception of how the beings of this old world are constituted, is responsible for this book, sermon and mouse-trap theory.

Need of Waking Up.

Consumers generally busy themselves with a host of questions more or less unbeneficial to their best interests and as a consequence, lose sight of this latter unless more extraordinary means than this "call of the wild" are adopted.

The increasing strenuousness of living will always tend to and gradually smother out this call, while that of the others will of necessity become louder. Mens' self-forgetfulness will continue to build a barrier to be assailed in addition to a path to be beaten and kept open. The exercise of yet undemonstrated genius will be required, and the veriest hint of a pilgrimage to the bush to get what we want, will spell failure at the outset.

THE WHEEL MUST BE "TRUED."

In cylindrical grinding we can never grind perfect work with an imperfect wheel. It is important that the operator shall realize that the more perfect and smooth his wheel, the more perfect and smooth his work will be, when making the light finish cuts. We make little or no attempt to grind smooth when making the roughing cuts. During these cuts, when the wheel is cutting heavy, the surface will be coarse and sometimes "chattered," owing to rapid work and deep cut, but this can do no harm if not too deep to "finish out." Between the roughing and finishing cuts the grinding wheel must be "trued" in order to obtain round, smooth work, and the lustre of the surface depends upon the lustre we produce on the wheel face when truing, also on the lightness of the cut we take, as well as on the speed at which we revolve the work when finishing. We evolve the work slower when finishing than when roughing.

When using a Norton Machine truing does not mean "sharpening" the wheel; but it does mean "dulling" the face in order to obtain a finish. It also means that when "truing," we perfect the wheel, viz., we make a perfect cylinder of the wheel in order to grind a perfect cylinder with it.—From a talk by C. H. Norton of Norton Grinding Co.

WIRE GUARDS.

The accompanying illustrations show two wire protectors which are very efficient. One shows a floor guard protecting gears and the other a wall guard protecting the switchboard. The one around the switchboard may be locked and thus prevent any tampering with it.

These guards are manufactured by the Canada Wire Goods Mfg. Co., Hamilton, and the two photographs shown were taken in their factory. Besides manufacturing guards for protecting machinery they make a line of incandescent light and window guards, etc.

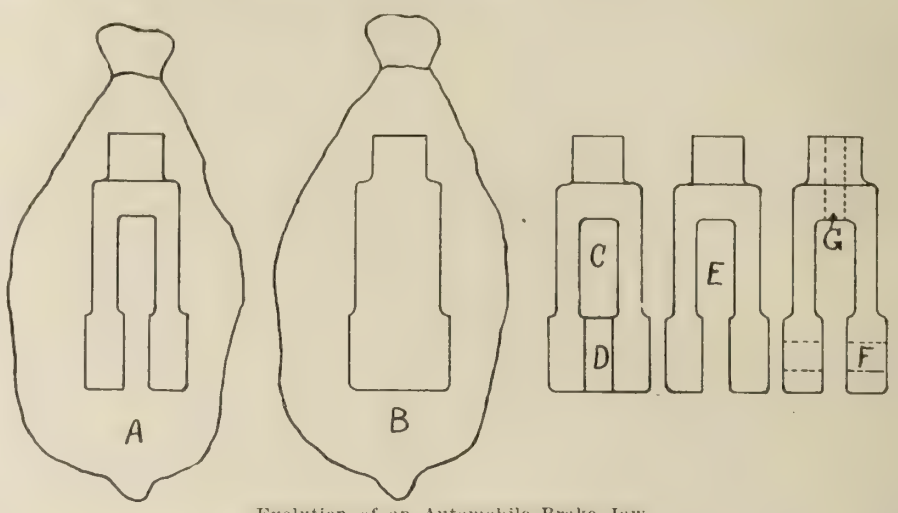
BRAKE JAW FORGING.

By K. L. K.

One of the interesting processes in the modern automobile plant is that of forging. In the works of the Canada Cycle & Motor Co., Toronto, various parts are evolved by a few simple operations. The equipment consists of a large power hammer and the necessary dies.

The die block parts in the centre line, the lower half being fastened to the centre line and the upper half to the ram of the hammer. The piece of stock from which the brake jaw shown herewith is made and which is used to illustrate the method of procedure, is heated to a good forging temperature. The upper half of the die block is used as a hammer to strike the hot metal a series of blows and thus force the hot metal to take the shape of the die block, filling the recesses in both halves and producing the forging shown at A.

Considerable clearance is allowed so that the metal can easily fill the recesses. A piece of stock is used large enough to more than fill them as will be seen by the metal wings on the brake jaw at A, which is the condition of the forging at the end of the first operation. In fact this is the end of the forging, the second being the trimming operation.



Evolution of an Automobile Brake Jaw.

To trim the brake jaw the anvil half of the trimming die block is hollow the shape of the brake jaw, while the ram is the shape of the jaw and exactly fits the anvil. The result is that the brake jaw is pushed through leaving the wing on the anvil. This operation is accomplished on a press.

The third is also done in this manner. The anvil die block consists of a hollow die block the shape of the brake jaw with ram or punch the shape of the centre at C. In the fourth operation the part D is removed leaving the brake jaw as at E. It is then drilled at F and G, thus completing the operation.

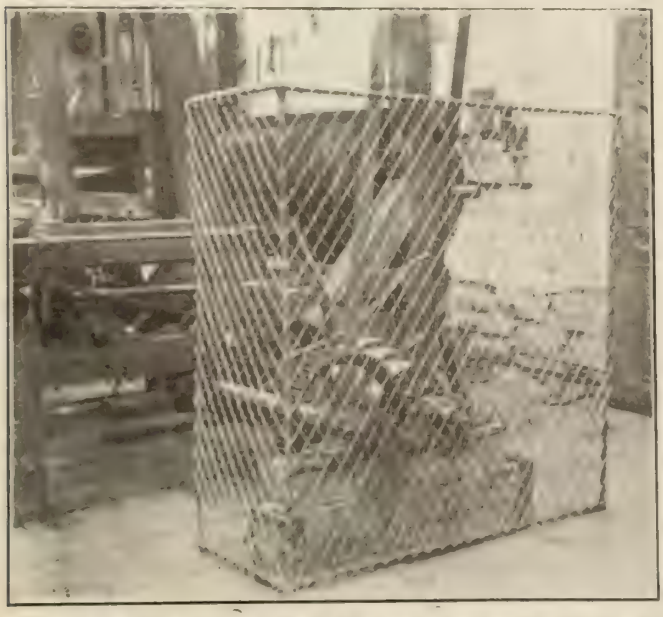


Fig. 1.—A Wire Protector made by the Canada Wire Goods Mfg Co., Hamilton.

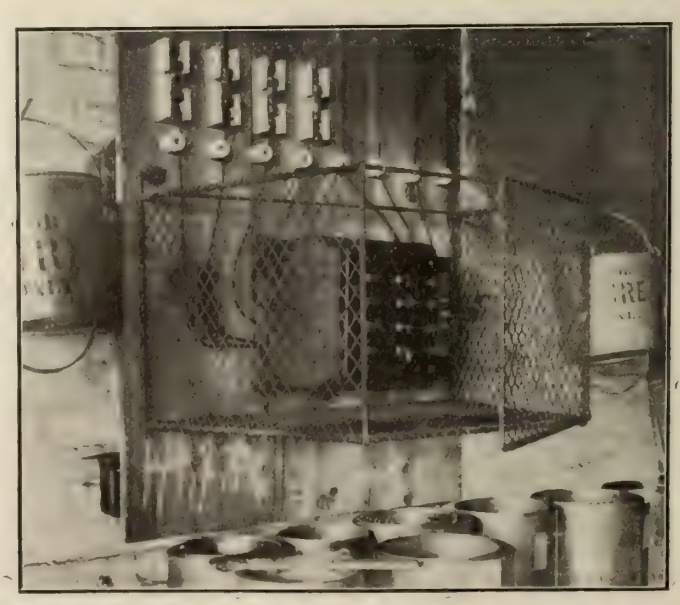


Fig. 2.—Wire Switch Protector made by the Canada Wire Goods Mfg. Co., Hamilton.

Boiler Design, Construction, Operation, Repairing and Inspection*

By H. S. Jeffery

The Various Points in Connection With Boiler Practice Will be Clearly Taken up in This Series. The First Article Deals With the Boiler Shell, Including Repairing, Factor of Safety, Hydrostatic Test and Number of Courses. The Series Will be a Complete Text Book on the Subject of Boilers, and They Should be Preserved for Reference.

The Rivet Pitch.

(12) The rivet pitch is a matter which must be decided first, and then the other parts arranged. The pitch must not be so excessive as to permit the plates to spring between the rivets, and which will cause the rivets and seams to leak. No stated pitch can be given for a certain thickness of plate, or for a certain size rivet—the best that can be done is to set a maximum pitch for different types of riveted joints with different thickness of plate, and then use whatever size rivet as will permit the riveted joint to be properly designed.

The following formula gives the maximum pitch:

$$(C \times T) + 1\ 5\text{-}8 = P$$

Where:

C=Constant applicable from Table 1.

T=Thickness of plate in inches.

P=Pitch in inches. (See note*.)

TABLE 1.

Rows of Rivets..	1	2	3	4
C. for Lap Joints	1.31	2.62	3.47	4.14
Constant for Double Butt Strap joints	1.75	3.50	4.63	5.52

Example. With a single riveted lap joint, plate 3-8 inch, what is the maximum pitch?

Solution:

(1.31 x .375) + 1 5-8=2.116 inches, or 2 1-8 inches.

Double-Strapped Butt Joints.

(13) The majority of boilers are now constructed with double-strapped butt joints for the longitudinal seam. The lap joint does not permit making the boiler as round as does the butt joint, nor does the lap joint make it possible to make the efficiency of the longitudinal seam as great as when the double-strapped butt joint is employed.

In Fig. 17 is shown a single riveted double strapped butt joint. It is single riveted as the shearing of either of the rows of rivets will permit the sheets to separate, though the rivets are in double shear.

Referring back to the calculations of the single riveted lap joint, it will be seen that the efficiency of the net section of plate is 62.5 per cent., while the rivet efficiency is 44 per cent. For the sake of illustrating it will be assumed

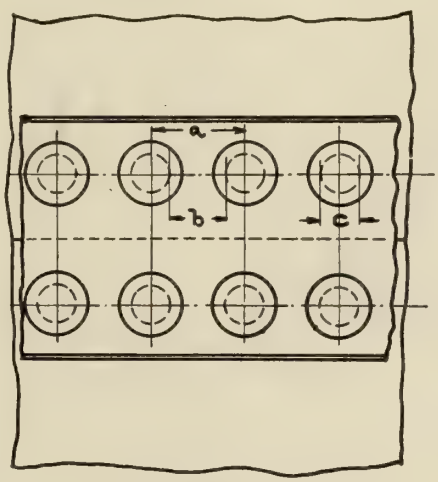


Fig. 17.

that the letters a, b and c, Fig. 17, represent the same values as in Fig. 12, which, of course, will mean that the efficiency of the net section of plate of Fig. 17 is 62.5 per cent.

But, the rivets being in double shear, increases their shearing strength, and thus their strength must be found and compared to the strength of the solid plate in order to determine the efficiency of the rivets. The shearing strength of the steel rivet in single shear was stated to be 45,000 pounds per square inch and that a rivet in double shear was 1.85 times 45,000 pounds, making 83,250 pounds.

Then substituting values, the efficiency of the rivet is:

$$\frac{.44179 \times 1 \times 83{,}250}{60{,}000 \times .375 \times 2} = 81.7 \text{ per cent.}$$

Attention is now directed to the fact that with the single riveted lap joint the rivet efficiency is 44 per cent., while with the single riveted double strapped butt joint (same size and pitch of rivets in both instances) it is 81.7 per cent. The efficiency of the net section of plate remains of course, 62.5 per cent. in both instances.

With the single riveted lap joint the efficiency of the plate exceeded the rivet efficiency, it being pointed out that to use a larger rivet would increase the rivet efficiency and likewise reduce the efficiency of the net section of plate, which would tend to equalize matters.

With the single riveted double strapped butt joint, the rivet efficiency exceeds the plate efficiency, thus indicating that the pitch might be increased so as to increase the efficiency of the plate and reduce the rivet efficiency.

Whether or not this course would be advisable relates only to the question as to pitching the rivets so as to make the joint steam-tight. The calculations indicate that the pitch can be increased to some extent, and now by referring to Table 1 and the formula in connection therewith this question can be decided.

Example. With a single riveted double strapped butt joint, plate 3-8 inch, what is the maximum pitch?

Solution:

(1.75 x .375) × 1 5-8=2.28 inches.

As the pitch used in the calculations was 2 inches, it will be seen that this is below the maximum pitch allowed, and, accordingly the pitch can be increased, thus causing the efficiency of the net section of plate to increase while the rivet efficiency will decrease. It is advisable, however, to keep the rivet efficiency above the plate efficiency to some extent, and to do this may make it impossible to increase the rivet pitch to the maximum pitch.

Wm. Edestrand, of the Dain Mfg. Co., Dain City, has been appointed manager of the Welland Machine & Foundry Co., Welland.

Some concerns in certain lines of manufacture requiring many comparatively simple and cheap special machines, make a practice of purchasing second-hand machine tools. The headstocks and slides are worked over at small cost so as to adapt them to the desired purpose. Many special machines are in use in a certain factory, built up from regular machine tools at very low cost, the functions of which are quite different from those for which the machines were originally designed.—Ex.

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*Note.—With a double-riveted double-strapped joint, the constant from Table 1 is 3.50, while with the double-riveted double-strapped joint the constant is 1.75. This has only reference to the pitch of rivets in double shear. Thus the pitch of rivets for the inner row of the triple-riveted double-strapped joint will have the same constant, 350, as used for the double-riveted double-strapped butt joint.

*Third of a series of articles on this subject.

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Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

SET squares or triangles 30-60 degrees and 45 degrees, Fig. 7, with sides 8 and six inches long respectively, are suitable for most services and may be had in maple, cherry or mahogany with ebony edge, or in vulcanite, celluloid or other transparent composition. The latter are much used with open centres as illustrated.

The pencil has been already referred to, the only additional remark called for in its choice being its hexagon shape requirement. As such, it serves the double purpose of giving a better grip between the fingers when in use and has little inclination to roll off the sloped drawing board when not in use.

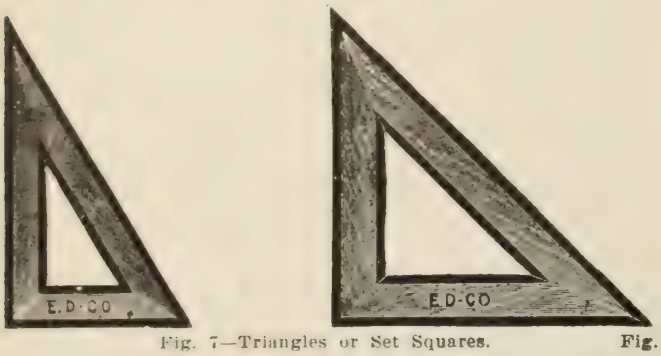


Fig. 7—Triangles or Set Squares.



Fig. 8—Drawing Pencil Points.

The pencil should be sharpened to a chisel point, Fig. 8, by means of which in the operation of drawing a straight line, the edge of the lead is kept close against the edge of the tee square or triangle.

Horizontal lines should be drawn from left to right and vertical lines from bottom to top of sheet. The tee square head should be held firmly against the board by the left hand and with the thumb pressure exerted on the blade as shown Fig. 9. The pencil also should be held firmly and vertically in the right hand, with the forearm and elbow kept well up from the drawing.

A very great help in keeping the otherwise unsupported pencil arm steady and ensuring against wavy lines, is to allow the little finger nail surface to touch the tee square lightly and allow it to slide along concurrently with the pencilling of the line. The arm movement in the drawing of straight lines should be as much as possible from the elbow.

Up to the present, only the apparatus for producing straight lines has been considered. Before passing to that pertaining to circles, parts of circles and curves, attention may be directed to pencil rubbers, or erasers for lines drawn in error or of excess length. Fig. 10 illustrates such an eraser, which should consist of soft fine grained rubber and be free from sand, glass or dirt, all of which tend to break or glaze the surface of the drawing sheet.

Compasses for drawing circles and parts of circles, vary in style, size, quality, purpose and price.

Those used for drawing large circles of varying diameter are generally 6 inches long. Such a set, Fig. 11, in addition to the needle and pencil points, includes a pen point and lengthening bar for circles in excess of those attainable by the self-contained instrument.

Small circles of varying diameter, and forming by far the major portion of compass work in the preparation of mechanical drawings, are best taken care of by the bow pen and pencil instruments. They are more conveniently manipulated, being lighter than the others and only 3½ to 4 inches long. Each tool as will be noted from the illustration Fig. 12, is complete in itself.



Fig. 11.

Spring bow compasses Fig. 13 are usually about 3 inches long and as their construction shows, are capable of accurate adjustment. They are most suitable in circumstances where a large num-

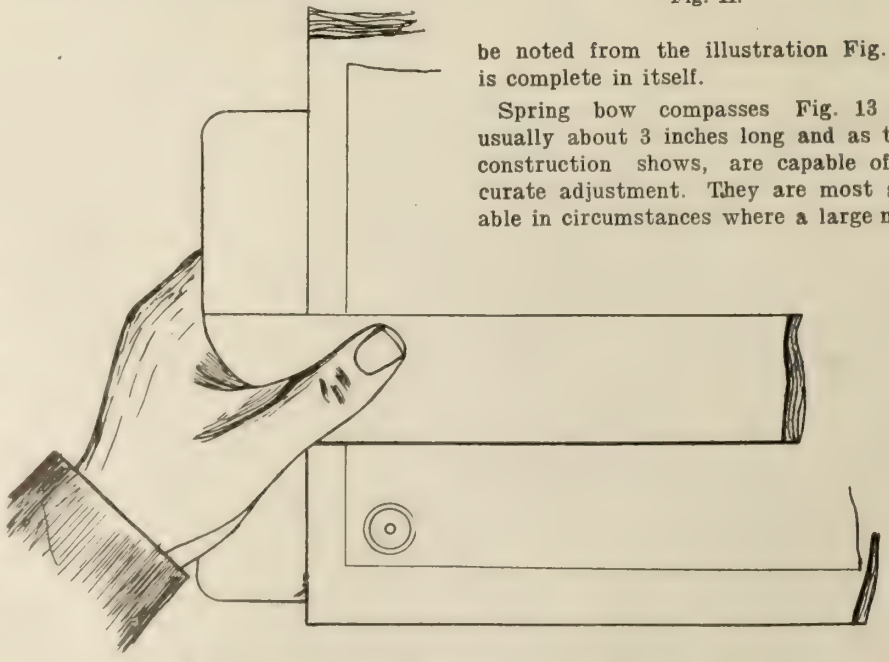


Fig 9—Application of T-square to Drawing Board.

*Third of a series of an Instruction Course. A lesson will be given each month

ber of circles of equal diameter are required.

The head joint of the two sets first described are an important feature to be attended to in making a selection for purchase. Double joints ensuring good lasting wearing surfaces should be their

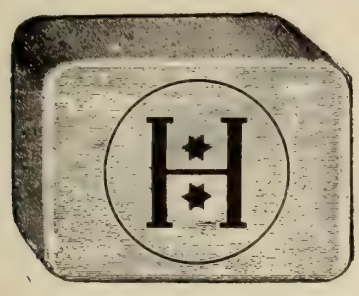


Fig. 10.

constructional detail. The needle, pen and pencil arms at the junction to the body should be similarly equipped.

The material of compasses generally, consists of German silver and good quality steel.

In purchasing instruments, those of the highest grade should be selected,



Fig. 12.

consistent of course with one's purse, if satisfactory work is to be comfortably achieved and usefulness of tools is to be guaranteed for 10 or 15 years under constant daily service.

The pencil for your compasses should be one grade softer than that of your drawing pencil.

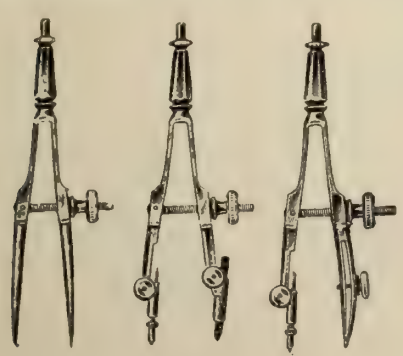


Fig. 13.

METAL LOCKER INSTALLATIONS.

By G. C. K

The value of the metal locker in the modern machine shop is being recognized. Formerly it was customary to drive a nail in the post and hang the coat or overalls, smock and towel any available place. The advantages over this method as well as over old wooden lockers, are many. For instance, wooden lockers are inflammable, badly ventilated, often uncleanly and full of vermin. They are thus very unsanitary whereas the metal lockers are safe and sanitary.

When a workman locks his coat, dinner pail, etc., in the locker of which he holds the key, he feels a sense of security, for each locker requires a different key. No employe can, therefore, unlock another's locker.

The use of the metal locker materially reduces insurance. There are no oil soaked smock and overalls lying around through the shop as these can be kept in the lockers.

Apart from the protective feature—affecting alike employers and employes—the educational value of the locker system in the cultivation of habits of order and self-respect is incalculable. If a workman is accustomed to putting away his own effects in the proper place, he will be more inclined to show similar care in putting away in their proper places tools and materials he has been using. Manufacturers, superintendents and foremen know what the care of machines, tools and materials, mean to the employer in dollars and cents.

Lockers are now being installed in a large number of the new plants but there are still a large number both of the new and older plants which should include them in their equipment. To the managers of these shops we would draw attention to the rule which was given due prominence in one of the workshops where the writer was employed, "A place for everything and everything in its place."

The adoption of the locker has been the natural outgrowth of modern business methods which has brought about conditions which make it absolutely essential that those things which assist in cleanliness, safety and dispatch shall be employed in up-to-date organizations.

In order to show that the lockers are growing in use the following list is appended:

Recent installations by the Geo. B. Meadows, Toronto, Wire, Iron and Brass Works Co., 479 Wellington street, west, Toronto, have been made; Somerville Brass Co., Berna Motor & Taxicabs, Ltd., Toronto; Northern Electric Co., Canadian Fairbanks, Montreal and Winnipeg; Brantford Carriage Works, Brantford; Robb Engineering Co., Amherst, N.S.; etc.

The Dennis Wire & Iron Works Co., London, Ont., have made installations in the plants of the International Acheson Graphite Co., Niagara Falls; Massey-Harris Co., Brantford; Tobin Arms Co., Woodstock; Lufkin Rule Co., Windsor; Kaministiquia Power Co., Fort William; N. T. R. shops, Winnipeg, etc.

The lockers shown in the half-tone were supplied by the Canada Wire Goods Mfg. Co., 182-186 King William street, Hamilton, who have made many important installations.

OBITUARY.

George A. Barnes, secretary of the Whitman & Barnes Mfg. Co., Akron, Ohio, was born at Cincinnati, Ohio, August 6th, 1857, died at Akron, Ohio, March 22, 1911. Mr. Barnes began his long service with the Whitman & Barnes Mfg. Co. at their Syracuse factory in 1876. In 1879 he was transferred to the Canton, Ohio, works of the company, remaining there as manager until 1895, when he removed to Akron, Ohio, at which place he resided until his death, with the exception of the years 1902 and 1904, when he was located at the Chicago offices of the company. At the time of his death, Mr. Barnes was Secretary of the company, a director, and member of the executive board. He is survived by a widow and one son, H. L. Barnes, who is superintendent of the Whitman & Barnes Mfg. Company's Chicago works.



A modern installation of lockers, made by the Canada Wire Goods Mfg. Co., Hamilton.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

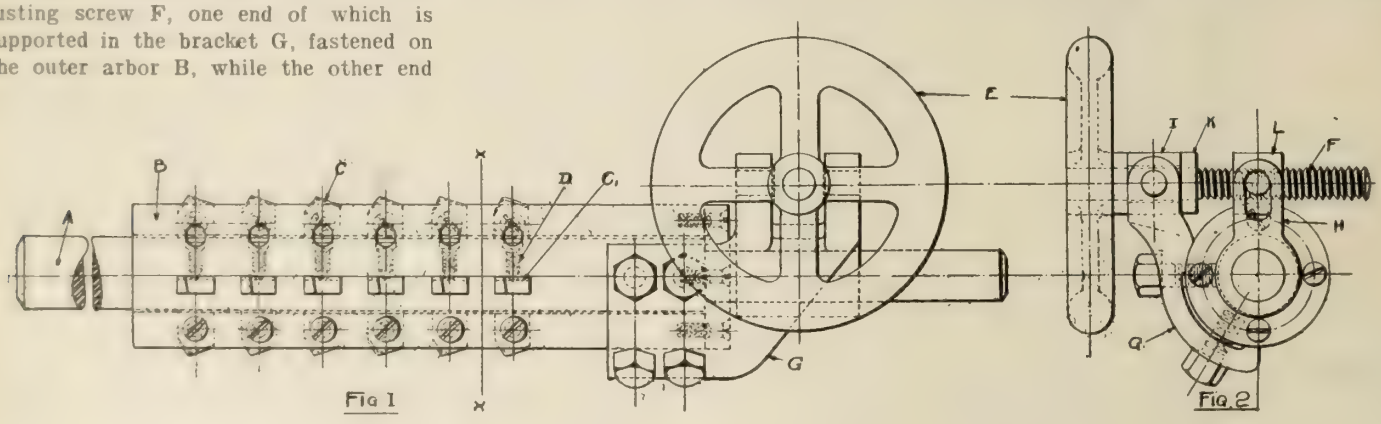
COLLAPSIBLE BORING TOOL.

By Jno A Bradley

A collapsible boring tool used for roughing and described in the following was designed for use in the manufacture of gasoline engines, but its adaptability to other lines may make this description of interest

Fig. 1 is side view, Fig. 2 an end view, while there is a sectional view taken through X X It consists of an inner arbor and cam shaft A, and outer arbor and tool holder B, cutters C of which there are twenty-four, and retaining screws D, a hand wheel E fastened to adjusting screw F, both of which are supported at one end by the bracket G and the cam shaft shifting lever H.

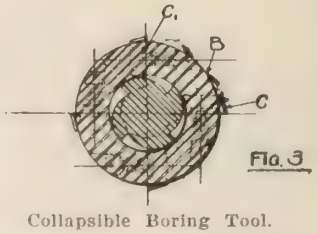
As previously mentioned this tool is used for roughing only. One end of the inner arbor and cam shaft A is inserted in the driving head, while the opposite end enters a pilot. When in operation the inner and outer arbors A and B rotate together, because of the adjusting screw F, one end of which is supported in the bracket G, fastened on the outer arbor B, while the other end



engages the cam shaft shifting lever nut L. The shifting lever H is fastened on arbor A.

The cutters C which are made a sliding fit in the outer arbor B are recessed as shown at C, to permit the end of the retaining screws D to enter, thus allowing the cutters to move in and out, a distance regulated by the length of the recess.

A very fine adjustment of the cutters is obtained by rotating the hand wheel E, the adjusting screw F having a fine pitch thread. The trunnion I supported in bracket G permits the adjusting mechanism angular movement



Collapsible Boring Tool.

The inner washer should be pressed or keyed on to prevent its revolving, and both should be relieved as shown in Fig. 2, so as to ensure a true bearing along the outer edge only. Compression rings of pulp or rubber should be used between the washers and the wheel.

The grinding machine of itself should be substantial and rigid, have well fitted

GRINDING WHEEL EQUIPMENT.

By Pedestal.

With a view to lessening the liability to accidents from breaking or bursting of grinding wheels, the Norton Co.,

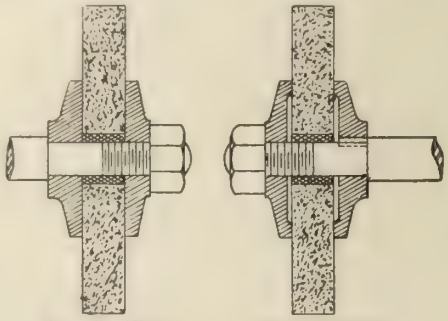


Fig. 1.—Wrong. Fig. 2.—Right.

Worcester, Mass., have applied themselves with much diligence and study to the question of equipment.

Results of experiments by them go to show that the wheels should be mounted on ample size spindles and that washers whose diameter is at least half that of the wheel be used as supports.

bearings and be securely fixed to proper foundations. Care should be taken to have the wheels true and in balance, and that the spindle hole admits of the wheel being slid on to the spindle without any appearance of play. The washers should be tightened just sufficiently to grip the wheel firmly without undue pressure.

To prevent work getting caught between the wheel and the rest, the latter should be adjusted as close up to the wheel as possible.

The speed of the wheels may be from 4,000 to 6,000 ft. per minute as required. All machines should be fitted with a sign or indicator denoting their wheel diameter and spindle revolutions. Worn down wheels may in this way be utilized on machines speeded to suit their reduced diameter.

Single pulleys are to be preferred on the machines, obviating as they do the starting of new wheels at excessive speeds.

Protective hoods with trunks to fan suction should be fitted to conserve operators' health, and the care of the equipment should be delegated to a responsible person. Fig. 1 represents an improper method of wheel attachment, while Fig. 2 shows that recommended.

CLEANING SHOP MOTORS.

By M. E. D.

The common custom in cleaning shop mators is to attach the air hose and blow the dust off the motor into the air where the men are working. In a wood-working department this is particularly offensive and is attended with a great waste of air.

A method adopted by the Toronto Steeet Railway Co., in cleaning the

cars is to use a vacuum system. The use of the vacuum system for industrial uses has been greatly extended in the past few years and there appears no reasonable reason why this system should not be applied to the cleaning of motors. The dust will be sucked out instead of blown out and the crevices in the motor will therefore be thoroughly cleaned out and the dust, instead of being blown into the atmosphere to be breathed by the workmen, can be collected into a receiver.

ROPE GROOVE GRINDING APPARATUS.

By Kelpie.

Inaccuracy of turning all the grooves on a rope pulley to the same gauge in the machine shop, and the subsequent installation of the pulley in the mill or factory, inevitably leads to operating trouble in the matter of unequal rope tension.

The apparatus here described and illustrated, Figs. 1 and 2, was specially designed to rectify such a defect at a lesser cost than that of dismantling the pulley and shipping it back to the machine shop. The sketches show it to be simple in constructional detail, of application to pulley widths between wide limits and adaptable to almost any local conditions. It is a useful portable tool for a jobbing machine shop to carry, occupying small space and of moderate weight for transportation.

The rope pulley requiring grinding had 23-1 inch rope grooves on a diameter of 40 inches. Its speed was 475 revolutions per minute.

The detail of the grinding equipment consisted of a shaft $3\frac{1}{2}$ inches diameter for a body length of about 6 feet and threaded $3\frac{1}{4}$ threads per inch. The ends of the shaft were turned down to $2\frac{5}{8}$ inches diameter to fit standard flat boxes. The lengths of these reduced ends were 13 and 27 inches respectively.

In addition to the large diameter being threaded, a keyway for fixing the grinding wheel was cut along its entire length. The emery grinder was 20 inches diameter and with its shaft had an operating speed of one half that of the rope pulley or 237.5 revolutions per minute. Adjustment was made by means of the keyway and locknuts as shown.

Further and closer adjustment of the grinding wheel to the side of the groove was got by the bridge screws on each end of the grinder shaft.

The emery wheel as will be noted has its grinding surface on one side only, by reason of which one side of each rope groove is completed in one lengthways operation. For the return, the emery wheel is reversed and the like process gone through until all the grooves have been treated. From time to time it was necessary, of course, to roughen and keep the emery grinding face true.

One difficulty experienced in tackling a job of this description, that is when the rope pulley has been in service, is the almost constant glazing of the grinder face by oil and grease secreted in small crevices of the various grooves, no matter how great pains are taken to have as far as possible complete extraction made before starting operations.

The drive, as will be noted from Fig. 2, is self-cootained. A single sheaf pulley 10 inches diameter is mounted on the driving shaft and roped to a similar pulley 20 inches diameter on the grinder shaft by an endless 1 inch rope and idler pulleys with weight tightener.

The whole equipment is reliable, compact and easy of application to a variety of installation.

Needless to say excellent, accurate and effective work was performed by the apparatus, with the result that an equable rope tension was attained at a comparatively low cost and with the minimum of delay and inconvenience to the regular operation of the mill.

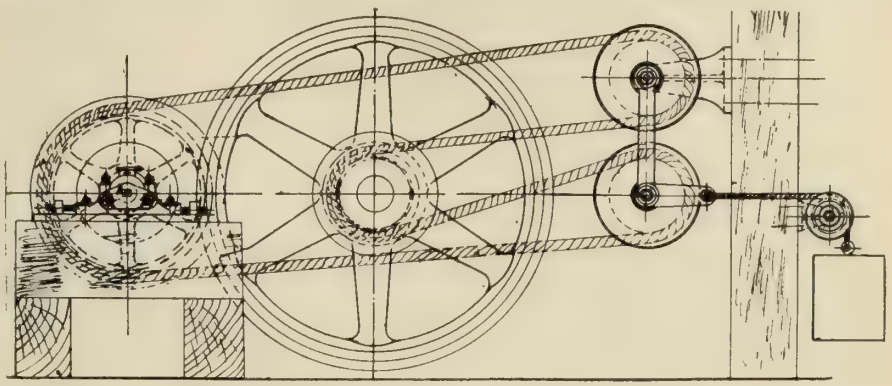


Fig. 2.—Elevation of Rope Groove Grinding Apparatus.

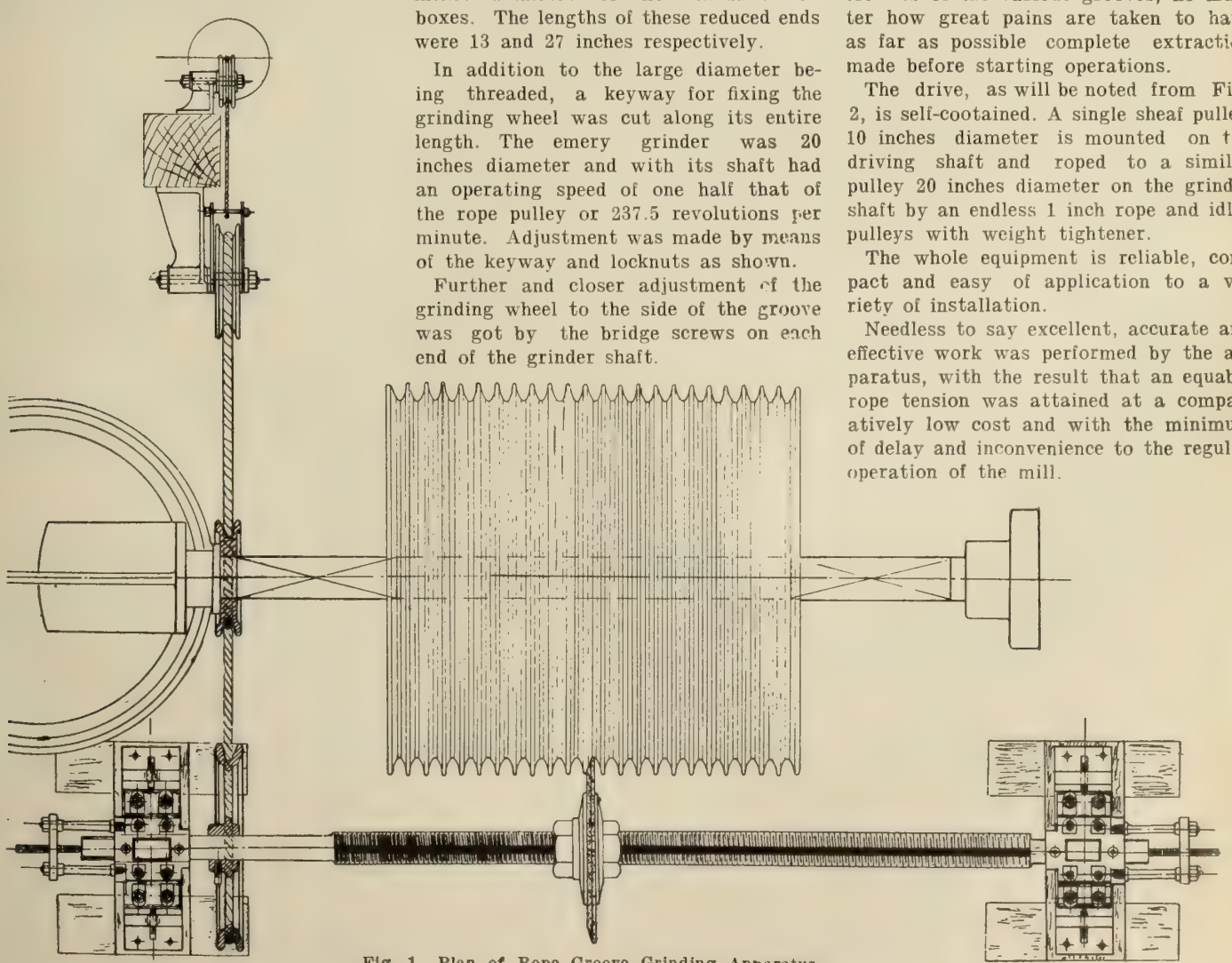


Fig. 1.—Plan of Rope Groove Grinding Apparatus.

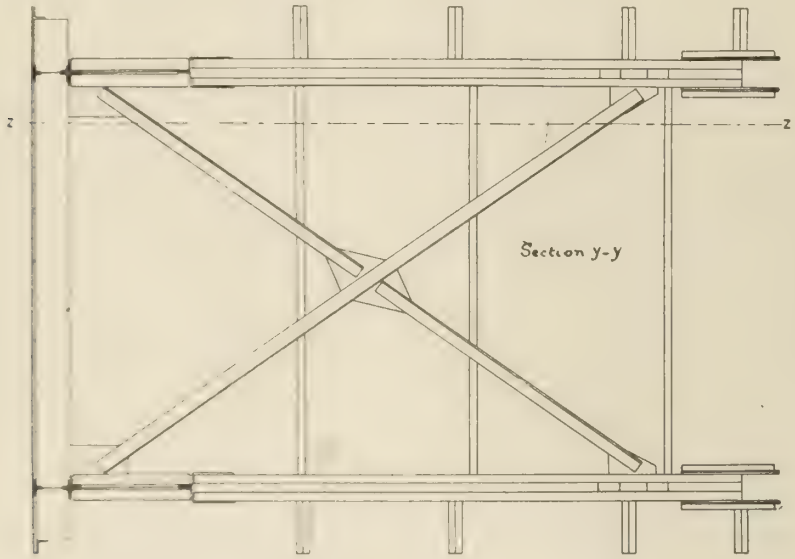
DAM OF UNIQUE DESIGN.

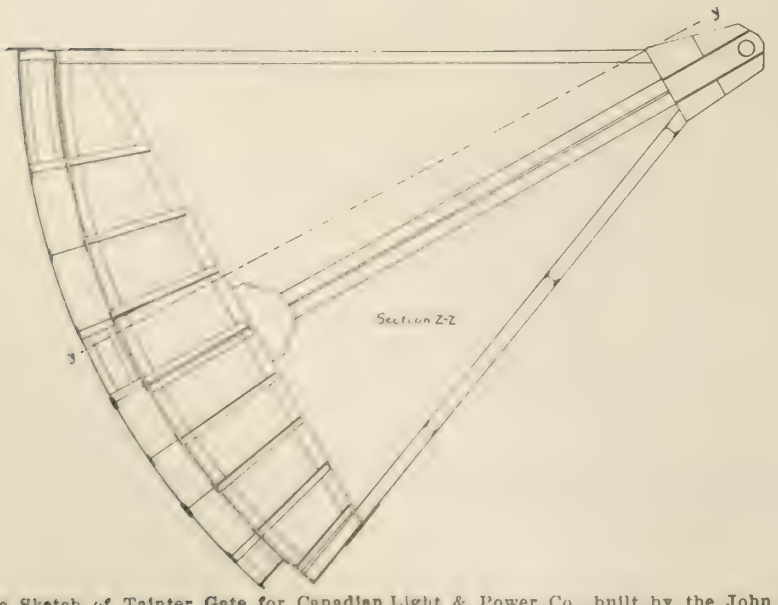
By M. E. D.

The John Inglis Co., Toronto, recently constructed a dam gate of unique design, for the Canadian Light & Power Co. It is known as the "Tainter Gate," and shows how the stresses increasing with the depth of water are taken care of in the dam. A side view is the shape of a segment of a circle as shown in the illustration.

The distances between the I-beams from the bottom up are approximately 1' 8", 2' 4", 2' 3½", 2' 5", 2' 9½", 2' 11", 3' 1" and 4' 6" which shows the relative pressure of the water at various points.

The upper half of the sketch shows a top view. The gates swing on the bearings shown. The plate into which the shaft fits is embedded securely into the concrete damp so that the Tainter gate is easily raised or lowered. Four of these devices were built, all the parts being carefully fitted before shipping.





Outline Sketch of Tainter Gate for Canadian Light & Power Co., built by the John Inglis Co., Toronto.

SIMPLE GRINDING FIXTURE.

By Donald A. Hampton.

I had been in charge of the shop but a short time when I was confronted with the job of reducing ten thousand pieces, like Fig. 3, to a uniform thick-

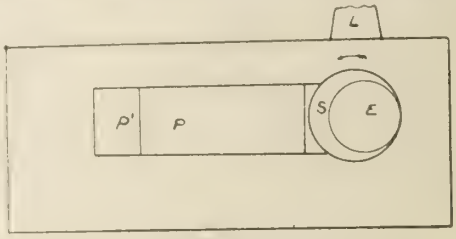


Fig. 1.

ness of 3-16 in. These had been cut from bars 1 inch in width and, while I would have preferred to "strip" them in longer lengths, the job was there and waiting and up to me. The steel varied a 1-64 inch, my given allowance was .001 in. above and .002 in. below actual size.

In the grinding room was a Norton grinder of the radial arm type which was unusually well supplied with gauges, angle plates, etc., and it was by use of one of these angle plates that I put the job through. Fig. 2. shows the device in perspective, the details of which are seen to a larger scale in Fig. 1. The angle plate was drilled for a shaft S which, at the back of the plate, was furnished with a lever L. The front end of the shaft was turned eccentrically as at E, for a distance equal to the thickness of the work pieces—3-16 in.—and hardened. A hardened piece P was made and inlaid

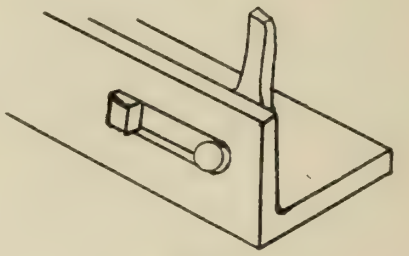


Fig. 2.

close up to the shaft S with the portion P extending beyond the face of the plate 1-16 in., as did also the eccentric end E. The fixture was then ready for work.

Now, with the lever adjusted in the right position, the work pieces were held most securely, at the same time quickly and easily, for ⅛ of a turn was sufficient to give the operator all the room needed for inserting. When the lever was released, the pieces fell off in a box. To offset the convexity of the stock, the part P was relieved through

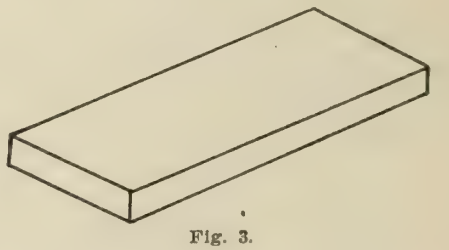


Fig. 3.

the centre and a clearance was provided next the shoulder P' for burrs and dirt.

To faciliate the work, a boy sorted the stock into three piles .005, 010 and .015 inches large, using an adjustable gauge for the purpose. The grinder first reduced the .015 inch stock to .010 inch, which was combined with the pile already waiting and this in turn further reduced. By so doing the operator's work was made uniform throughout, all pieces were passed across the face of the wheel the same number of times (3 or 4), and there were no excuses for slovenly work because of high and low stock creeping in.

PORT DRILLING JIG FOR PNEUMATIC HAMMER.

By Penstock.

The device here described is that used by the Maximilian Pneumatic Tool Co., Woodstock, Ont., for drilling the port holes in the cylinders of air hammers manufactured by them.

Fig. 1 is a sectional elevation of the hammer cylinder, the air ports in which, are indicated by the letters AA. These ports are each 3-16 of an inch in diameter and vary in number according to the power requirement of the hammer.

It should be noted that they are about 5 inches long and that the wall of metal on the inner edge after drilling is only

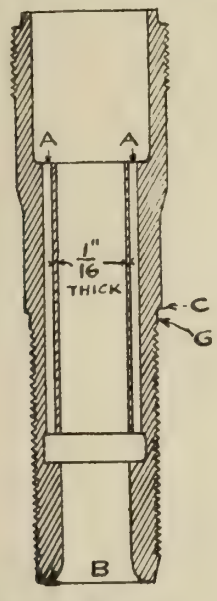


Fig. 1.—Sectional Elevation of Pneumatic Hammer.

1-16 of an inch thick. To secure accuracy of drilling, a suitable jig becomes therefore a necessity, and fig. 2 gives a representation of same.

The jig as will be seen has a large diameter machined base to which the body is bored and threaded square and true. The extreme diameter of the body is 3 inches, while that of the base is 8 inches. The thread, 8 per inch tapers from $2\frac{3}{4}$ inches to 3 inches diameter, ensuring with the 4 slots K, a compression grip when the nut F is screwed down. These slots are 3-32 of an inch wide by 5 inches deep.

Application consists in placing end B of the hammer cylinder into the jig barrel so as to bring its shoulder C to rest on the jig face D.

Tightening the nut F on the taper thread, locks the cylinder securely at its plain part G.

The nut F has a milled edge, and hand tightening of it is sufficient in all cases.

PORTABLE ELECTRIC OR AIR DRILLS.

By D. C. Current.

One of the handiest tools around a machine shop is the portable electric or air drill. Recently we experienced some trouble in erecting some agricultural machinery. Either the machine hands were careless or the jigs were inaccurate. In any case the bolts would not go where they were supposed to fit and it used up a lot of time and patience reaming out the holes by hand. The air was not piped to the warehouse so we purchased a portable electrical drill which has paid for itself many times over.

Later one hole was omitted altogether from several hundred frames. To send them back from the warehouse to shop would have caused a long delay and considerable expense. The portable drill

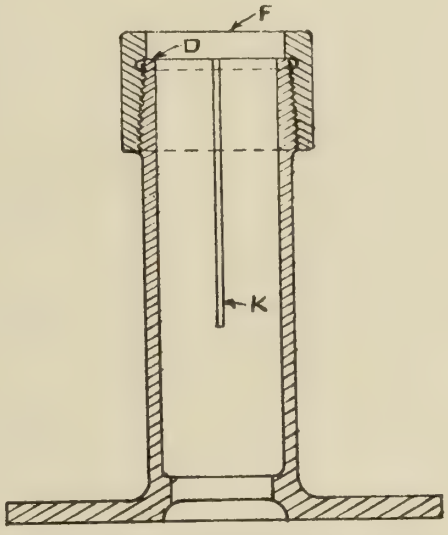


Fig. 2.—Sectional Elevation of Port Drilling Jig.

solved the difficulty and the machines were shipped on time. The portable drill whether air or electric is one of the best cost saving devices around the shop.

Correspondence

Comments on articles appearing in Canadian Machinery will be cheerfully welcomed, and letters containing useful ideas will be paid for.

Information regarding manufacturers of various lines, with their addresses will be supplied either through these columns or by letter, on request. Address letters to Canadian Machinery, 143-149 University Ave., Toronto.—Editor.

* * *

Use of Common Salt.

1. Please suggest the proper method of melting common salt in a crucible for heating tool or cast steel to the proper heat before being dipped into the cooling bath, for hardening.

2. Do you know of any substance to add to the salt to help it to melt at a lower temperature than when alone?

3. About what is the temperature at which salt will become a fluid?

4. Would you advise rock or common salt for melting in a crucible ?—A subscriber.

Replying to your favor, I must say that I have never heard of common salt (chloride of sodium) being used as a heating solution in tempering operations; a solution in combination with other chemicals such as alum, oil of vitrol or corrosive sublimate, may be used successfully as a cooling medium in tempering low carbon or inferior steels. —Reader.

Common salt which has a specific gravity of 2.16 has a melting point of 776 degrees. Plain sea water is used where any unusual degree of hardness is required and no temper is to be drawn, or on special steels such as soft centre plow steel. When sea water is not obtainable the following is a good substitute: Carbonate of soda, 2 lbs.; saltpeter, 2 lbs.; and salt 20 lbs. Dissolve in a barrel of water.

For hardening tools dissolve rock salt in rain water and use solution over and over again. The longer it is in use the better the solution for tempering.

Alloys of lead and tin, lead only and boiled linseed oil are also used for tempering.—M.E.D.

We would be glad to have any of our readers write us answers to the questions asked by this subscriber?—Editor.

* * *

FASTENING WORK ON PLANER.

By Machinist.

In the December 1910 and January 1911 issues of Canadian Machinery methods were given for holding work on a planer. I have a large number of flat castings to plane and experienced great difficulty in getting them true until the patternmaker came along one day and said he would soon remedy my troubles.

He put lugs on the side of the pattern with holes cored in them, making the distance between the centres of the holes equal to the distance between the centre of the T-slots in the planer. It is now an easy matter to bolt on the work for surface planing.

* * *

What are some of the uses to which aluminum is put? Is it an expensive metal?—A. B. Barron.

Aluminum is used to produce solid ingots and castings, for household utensils and electric transmission lines. If you write the British Aluminum Co., 24 Adelaide street, West, Toronto, they will send circular matter and lists. —Editor.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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FRANCE

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Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Aus lia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. VII. April, 1911 No. 4

THE EFFICIENCY ENGINEER.

In our February issue, "Incompetency and Inefficiency" formed the subject of a brief editorial. We there stated that no data was available of basis or viewpoint of the estimator in the conclusions drawn.

Pushing our investigation a step further, we are at a loss even to locate the personality of the estimator. There is no trace of his origin, training, education, superlative intelligence and infallible reasoning; in fact nobody has ever met him, yet he seems existent.

Disciplinarians we know, inventors we know, experts in carrying out or doing special work we also know, and the big bluff we are certain of having seen and heard, but these men, these estimators, these efficiency engineers, who direct and operate through graded subordinates, everything under their care by increased competency to a higher plane of efficiency, we are strangers to unfortunately so far.

"Out of the fulness of the heart doth the mouth speak," and out of the emptiness of the head doth it at least likewise. Being so, the "big noise" may not necessarily count.

It strikes us that there is a too vague generalizing liberty taken by incompetents, and splarging of crazy ideals by idle dreamers.

"To make a silk purse out of a sow's ear" although yet impossible of attainment, has about as much probability of accomplishment as these hot-air effusions have of doing or being of any service to one branch or another of business or manufacture.

The incompetency and inefficiency cry is a fascinating one, and many are attracted to join in it, on account of the opportunity it affords of appearing famous in the public eye, at a cheap rate on a light-weight brain capacity.

The efficiency engineer as represented, is a myth so far as effective work performed is concerned. The name is being made a travesty of, by those who would cover up their own uselessness in displaying the weaknesses of others.

There is too much of the 5 cent moving picture show, prominent in the engineering profession and technical journalism to-day; too much dictation of what a man should be, and too little attention paid to means of realizing it.

Reckless and fiercely colored word pictures of what is expected and how far he falls short, unsettle him in his work and without doubt make him feel, "if I had the wings of a little dove, far, far away I would fly."

Cut out these ideas that a set of superior beings, know-it-alls, efficiency engineers or whatever you elect to call them, exist, and keep us from getting excited any more because we have never met them and are unaware of their name and address.

Let us get alongside the man at the machine, shovel or desk, give and get from him all the information and assistance he or we need or have at disposal.

Encourage a reciprocity agreement on similar lines between each man and the fellow at his shoulder; make them feel that the edging of one another further along the road of progress, accomplishes more than either could do for himself alone; and impress them that if they never meet the ideal efficiency engineer, they will have the personal satisfaction of laying claim to being at least, brands of the real thing.

ACCIDENTS, PREVENTION AND FIRST AID.

In this issue of Canadian Machinery is an article on "Safeguarding Machinery in Industrial Plants." Probably there is not a shop official including foreman, superintendent, master mechanic or manager who cannot recall an accident which happened in the shop under his charge and decreased the efficiency of his shop, and which the exercise of a little precaution in selecting machinery, transmission appliances, the wise expenditure on proper guards for gears, punches, etc., might have prevented.

Warning notices may be used to good advantage, but should be short and pointed. They give a protection from damage suits, but are not very efficient in preventing accidents.

In the best of organizations, accidents will happen and shop officials will find it to advantage to organize "first aid" corps who can give immediate and competent first-aid services within the plant to every injured person. The prompt cleaning and dressing of slight accidental wounds gives great relief to the sufferer and renders any later medical attention more effective. In the majority of cases nothing more is needed, but neglected or delayed treatment of simple injuries may have most serious consequences.

Every works executive and engineer will find it a valuable adjunct to the safety engineering of the plant to maintain in every department, apart from labor law and casualty insurance reports, a full and accurate record of every accident and also of every near accident. Periodical examination of these and the determination of every mechanical engineer to practice safety engineering to the best of his ability, without regard to the legal minimum or compulsion, will help more than anything else to remove speedily a great reproach from our industrial life.

THE STORES' DEPARTMENT.

It has been demonstrated that the plant that does not take proper care of its stock, is losing money and reducing profits. The system of piling stock in any out of the way corner of the plant yard exposed to the elements is rapidly becoming obsolete due to the foresight of those in charge studying the question intelligently. There are still some managers who have not yet heard of "Scientific Management" as far as the stock room is concerned. The writer visited one plant recently where two men were busy with shovels and axes trying to extricate some grey iron castings from the snow and ice which is so common in this country. In the not too careful endeavor to release them, several were broken and this loss was added to the wages of the men. It should not therefore, require much headwork to figure out the saving in providing a shelter for the output of the foundry before it is required for use in the machine shop.

In that plant there was no central stock room and when a workman erecting machinery desired some bolts he was allowed to help himself. If he had 100 pieces to put together and required 100 bolts, he generally helped himself to 110 or 115 in case there were some defective ones. When they were bolted in place, he found he had 12 or 15 bolts over. These were put under the bench for use some time hence and forgotten. When the next hundred was ready for erection there were another 115 bolts taken from the box and those left over were put away as usual finally finding their way into the sweepings that were thrown out.

Another incident that occurred was in connection with the blacksmith shop. When the foreman wanted stock he hunted it up and helped himself. One day he wanted stock for a certain job and in hunting for it, he came across some two inches too long. He had it wheeled into the shop, cut off the shears and forged into shape. Later he had another part for the same machine which required stock two inches longer than the first job, but on a hunt, all he could find was stock two inches too short. He had used the wrong stock. A consultation with the company's buyer would have put him right. A central stock room in charge of a competent man, would have eliminated all these wastes. It will pay you to have a proper stock department.

THE BUSINESS MAN'S AWAKENING.

Increased profits and more pay for the men by the application of Scientific management. Nearly every magazine, city daily and country weekly in Canada and the United States has had something to say about it, whether they knew anything about it or not. The fact is that the time to wake up has come for the shop manager, superintendent and foreman. "Rule of Thumb" methods have served in the drafting office and in the shop for years, but the days of such methods are passing for the wide awake shops. The change is not going to come about on account of some of the sweeping charges some papers make, but on account of the clear understandable concise way in which the technical press is placing before these men the results of experiments and studies along this line.

Charges have been made chiefly against the railroads. In a recent issue of the Atlantic Monthly, E. P. Ripley, president of the Atchison, Topeka and Santa Fe Ry. discusses the question and says :

> Railway managers do not deny that many mistakes have been made and many abuses have grown up in the development and administration of American railways. But they do deny the truth and fairness of many of the counts in the sweeping indictments of the roads that have been made and printed throughout the country, and feel strongly that most of the public hostility to the carriers is unjust. They do not doubt that the public means to be fair. But they feel that it has allowed itself to be misled, to its own injury, by those wholesale charges of wrong-doing. They believe that some of the legislation that has been passed recently is wholesome. But they think that many laws that have been enacted, and many projects for further regulation which are receiving popular support, are unwise, because they aim to do things that are undesirable, or to secure ends the attainment of which would be impracticable even if it were desirable.

The fact is that such railroads as the Santa Fe, New York Central, C.P.R. and G.T.R., have been very progressive, as the systems of education, taking care of stock, tools, dispatching work, etc., have been kept up-to-date and men have been employed who are conversant with modern systems of business management.

A great deal may be gained by shop managers by watching someone else. "Many of our ideas," says Frederick W. Taylor, "we appropriated from some one else." But Taylor experimented too and one experiment alone saved $75,000 a year for the Bethlehem steel works. Taylor's experiments in the cutting of steel are now well known by every user of high speed steel.

The new movement is a world wide one and France and Germany are now trying it out. Each job must be studied separately, the handling of coal, sand, etc., drilling castings or performing any other work. There is one way which is quicker than any other way and the planning of the works will be rewarded by increased profits for the investors and increased wages to their men.

COMPENSATION FOR INJURED AND AGED WORKMEN.

In this issue of Canadian Machinery is an article on protecting machinery and thus minimize the possibility of accident. Accidents do happen, however, and employers should guard against them as much as possible. When they do occur it is only reasonable that some steps should be taken to look after the men's welfare.

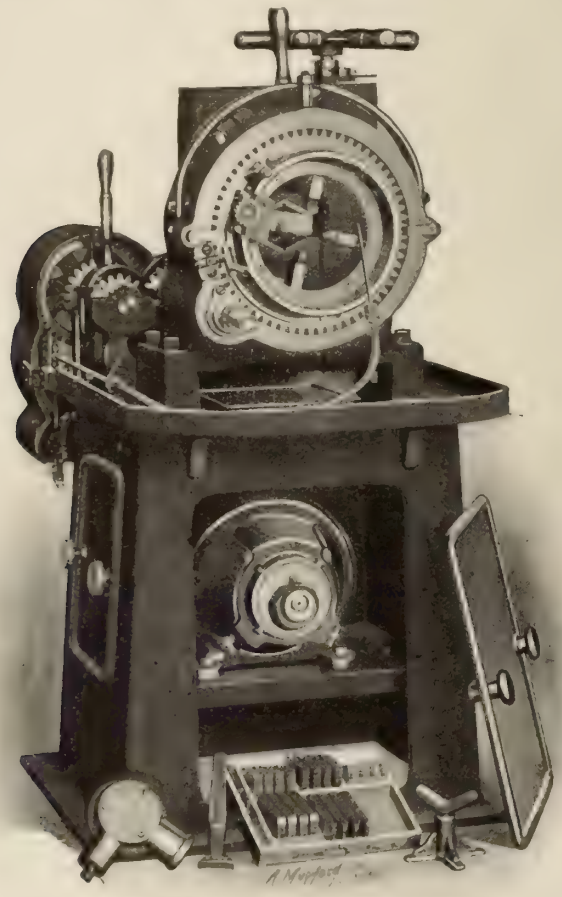
The same applies when a man grows old in the service of an employer. The Canadian Railroads recognize this and pension a workman after a certain number of years in their employ. If a firm or company buys a machine and pays for it he can do with it what he will but if he rents that machine and it is damaged, he feels in duty bound to replace it. When an employer rents a man's brain and hands, therefore, and that man is injured or grows old in his service, he should feel morally bound to recompense. The Canadian Manufacturers' Association have taken up the question and it is hoped something definite will result. The question is one that could be dealt with by the Provincial Governments and the Labor Department of the Federal Governments.

There is no better course of study for any apprentice or other young mechanic than to become as familiar as possible with the many names and terms used in the shops. While these vary in different sections, there are always enough floating from city to city from whom to learn many of the local terms with little trouble. While it would be difficult to put a pay-day price on this knowledge, no one can fail to be of more value who can call a tool or part of a machine by its right name, rather than to designate it as a "thing," preceded by one or more lurid adjectives.—Ex.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, and Blacksmith Shop or Planing Mill.

MOTOR-DRIVEN PIPE MACHINE. The Curtis & Curtis Co., of Bridgeport, Conn., have just placed on the market, a new design of electrically driven pipe cutting and threading machines, as shown in accompanying illustration. The die cutting head is of the usual Forbes pattern, and is mounted on a cabinet base with a motor for any current desired concealed within.



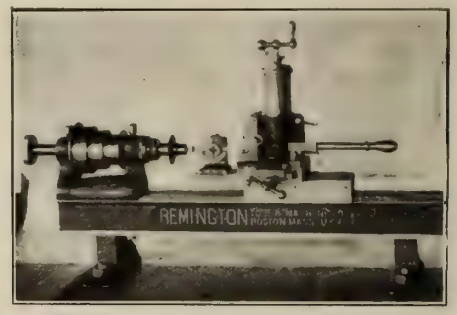
New Curtis & Curtis Motor-Driven Pipe Threading Machine.

The machine is entirely self-contained, both as to the machine itself, and the way the power is applied. The entire machine can be moved from place to place, and started by simply attaching the wires. A trolley may be used over the machine to handle the pipe. The machine can be taken out on large jobs, and easily moved from place to place. Various speeds can be obtained, or the machine can be started or stopped by simply throwing a lever, while the motor is allowed to run constantly.

The motor being situated inside of the base, it is protected from drippings of oil, or breakage resulting from the handling of long and heavy lengths of pipe and fittings. The machine is very heavily geared with a very powerful motor, which provides ample power for dull dies or hard pipe. An economical feature is that the dies are clamped by one movement of a lever. The Curtis & Curtis Co. would be pleased to send special information in regard to these machines on application.

AUTOMATIC VARIABLE FEED. The accompanying half-tone shows the automatic variable feed to the head as applied to the Rockford shapers. It will be noted from the illustration that the arrangement has been designed with the view of simplicity and absence of complicated parts, making it serviceable and not liable to get out of order. It feeds the tool either up or down and operates at any angle. The triangular shaped incline on which the roller rides can be readily adjusted to suit the position of ram or moved out of the way when not in use.

The lever shown on the side of ram with spring pin, regulates the amount of feed. Six changes are provided, as follows: .008, .016, .024, .032, .040, .048. The lever on top of the ram reverses the feed and throws the gears out of mesh, by placing lever in central position when not in use.



Remington Bench Lathe.

The Rockford shaper is manufactured by the Rockford Machine Tool Co., Rockford, Ill., U.S.A.

UNIVERSAL HORIZONTAL BORING MACHINE. The accompanying illustrations show a new No. 3 size of the universal horizontal boring machine, recently placed on the market by the Universal Boring Machine Co., Hudson, Mass. This No. 3 machine, they term their 3" x 30" x 30", which refers to the size and travel of the boring bar; the machine has a 3 inch bar, a vertical feed of 30 inches and a horizontal travel of 30 inches.

Fig. 1 shows the spindle drive. The machine is of the single pulley type and may be driven from the line shaft. A shifter handle is located at B. The drive to the spindle is transmitted from the speed gear box through the vertical shaft E to the head proper. The exterior and interior details of the head are shown in Figs. 2 and 3. The head casting is one single casting, with oil pockets cored out in the casting itself for holding lubricant for the bearings and gears.

In Fig. 2 are shown the various operating handles, the handle A reverses the direction of rotation of the spindle by operating the jaw clutch J, as shown in Fig. 3. The handle B, operates the clutch O, Fig. 3, changing the machine from direct geared drive to back geared drive.

As will be seen in Fig. 3, the power is transmitted from the speed gear box through the shaft E to the spur gear F, then through G to the bevel gear H. The bevel gear H, I and I_2 together with the clutch J make up the reversing

mechanism. From the reversing mechanism the power is transmitted direct to the driving gear, when the clutch O is engaged with K; or around through the gears L and M, when the clutch is engaged with N.

The driving gear has been placed at a point nearest the work, as shown in Fig. 4, Q being the driving gear and P the driving pinion. This arrangement secures stiffness in large milling cutters, and at the same time eliminating chatter. The driving gear has a long hub, which forms the spindle and to the spindle are fastened two keys V and V_2, which drive the boring bar. The hub of the driving gear forms a face plate to which a face milling cutter may be fastened, four holes having been drilled and tapped out for the purpose.

The design of the head casting permits the rack S to travel the full length of the head, thus the hand wheel for the quick movement of the boring bar is able to be placed on the head well in towards the face of the spindle allowing the operator to see his boring cutters and make adjustments at the same time. A travel of 30 inches at one setting of the adjustable collar T is obtained. The automatic bar feed is received from the feed gear box through shaft B, which carries a worm meshing with the worm gear U. On the same shaft with this worm gear is the spur pinion which drives the rack. Referring to Fig. 2, E, is a positive clutch, which secures hand wheel D, to the worm gear.

The spindle proper is surrounded by an oil reservoir, the gears run in a bath of oil lubricated by the splash system and the oil reservoirs will be seen as indicated by the letters I, J, L, K, M, and N. This system of oiling consists of a wicking laid in a slot milled out of the bearing, the ends of the wicking dipping down into the reservoir below. The large reservoir for the lubrication of the main spindle bearings is filled at N, and drained at O.

The method of transmitting the automatic feed to the table is shown in Fig. 5. The table has been removed from the saddle, so as to show the details of the feed. The power is transmitted from the feed gear box through the shaft X which carries mounted on it a 45 degree spiral gear meshing with the 45 degree spiral gear W and a jaw clutch. The spiral gear runs free on shaft X, while the jaw clutch is keyed with a sliding spline. The spiral gear W carries the nut for operating the table feed and when the lever at the right of the saddle is pulled out as shown the jaw clutch engages corresponding teeth in the hub of the spiral gear beneath the saddle, thus engaging the feed. The stop Z is for throwing out the cross feed automatically. At Y is shown a nut secured to

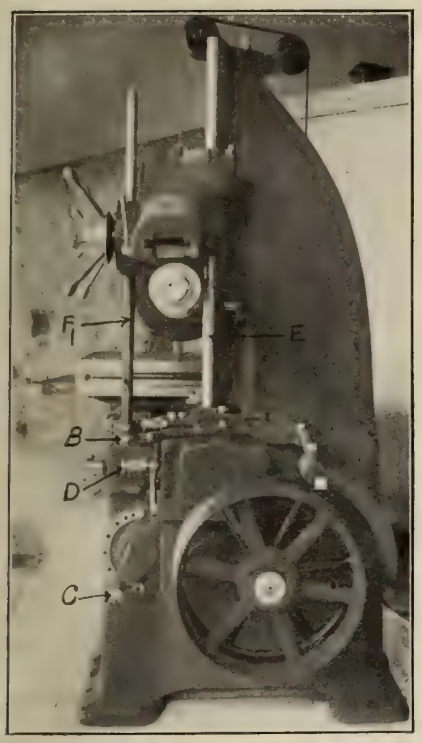


Fig. 1.—Spindle Drive Universal Horizontal Boring Machine Co., Chicago.

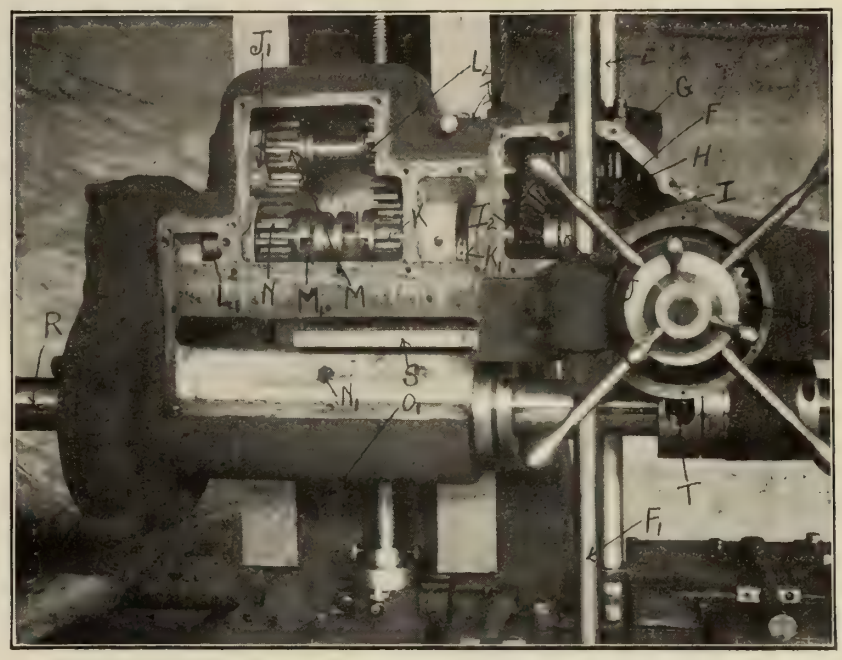


Fig. 3.—Power Transmission, Universal Horizontal Boring Machine.

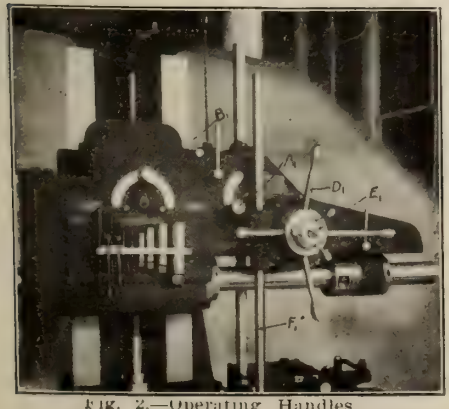


Fig. 2.—Operating Handles.

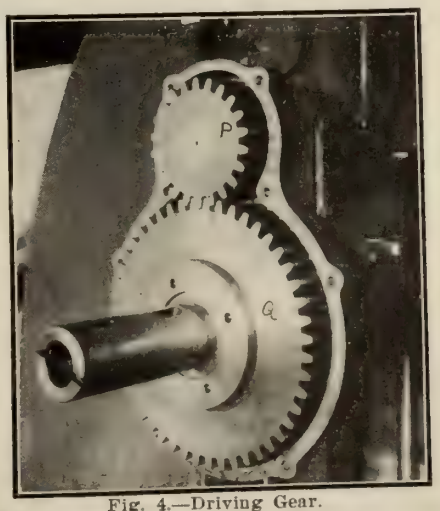


Fig. 4.—Driving Gear.

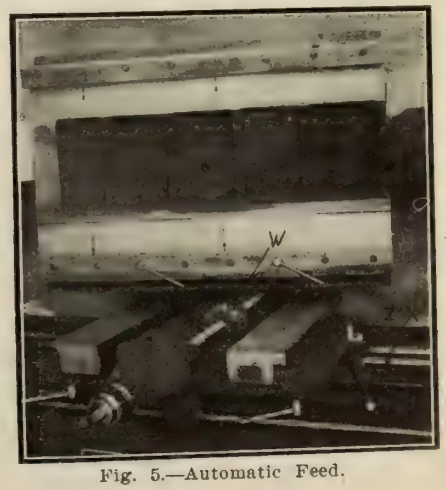


Fig. 5.—Automatic Feed.

the saddle so that the saddle and table have travel by power or hand longitudinally along the bed of the machine. Hand crank feed with micrometer adjustment is furnished for the operation of the table for longitudinal and cross movement as well as automatic feed.

The gear box contains the feed and speed change gears, which are made of steel; these gears run in a bath of oil providing sufficient lubrication, quiet running, and consequent long wear. Eight speed changes are secured from the gear box, by means of levers C and D, Fig. 1, and these are doubled at the head by the back gear lever, giving a range from 15 to 200 revolutions per minute. There are nine feed changes in either direction for the head, one lever reversing or stopping all feeds and retaining their relation to each other. The feeds range from ¾" to 5½" per minute without reference to the speed of the spindle.

INTERNAL GRINDERS.

The Bath Grinder Co., Fitchburg, Mass., have placed on the market attachments for their grinders for internal grinding. Fig. 1 shows the No. 5 machine with improved swivel head stock arranged to grind straight or taper work by the grinding spindle entering the hole from the back end, the headstock shown on the right with the water shield cover open, to true the wheel or mount or remove the work from the headstock.

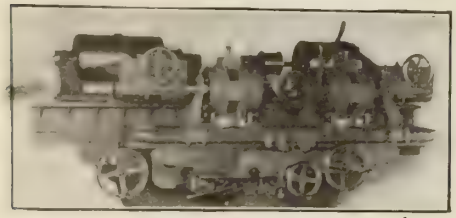


Fig. 1.—Bath Grinder with Improved Swivel Headstock.

Fig. 2 shows the same machine with special headstock furnished for grinding pneumatic hammers and long bushings.

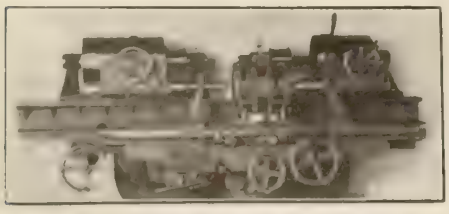


Fig. 2.—Special Headstock for Grinding Pneumatic Hammers.

Fig. 3 shows both No. 2½ duplex internal grinder. This machine has only one spindle head with two grinding spindles projecting from each side and driven by one belt. Fig. 4 shows this machine with the face plate and universal chuck mounted in the headstocks, with the grinding spindles entering from the back end. Fig. 5 shows the headstock reversed and the arrangement of grinding from the front end of the hole in place of the back end.

Fig. 6 shows improved swivel headstocks and assortment of work holding



Fig. 3.—Bath 2½ Duplex Internal Grinder.

fixtures furnished with No. 2½ and No. 5 machine. A gives an end view of the headstock furnished for grinding pneumatic hammers and long bushings. B shows 4½" steel spring collet. C shows a set of reducing bushings furnished with B spring collet for reducing the hole to size. These bushings are furnished in 8 sizes. D shows a step spring chuck, with jaws for holding work that cannot be held inside of the spring chuck. The

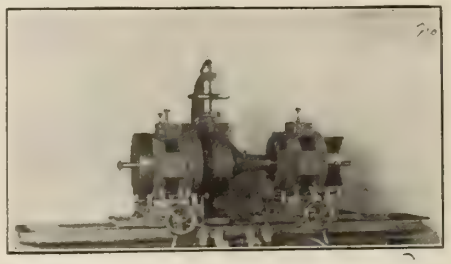


Fig. 4.—Face Plate and Universal Chuck Mounted in Headstock.

reducing bushings C can also be furnished with spring chuck D. E shows the 4-jaw independent chuck mounted on quill, and is held in the spindle head, the same as B or D. F shows face plate. H and I show spindle heads as shown with machine in Fig. 1 and 3.

Fig. 7 shows 8 sets of internal manufacturing spindles for No. 2½ and No. 5 grinders. A shows a set of large spindles made from one solid piece of steel. B shows a set of spindles that are used with No. 2½ and No. 5 machine, mounted

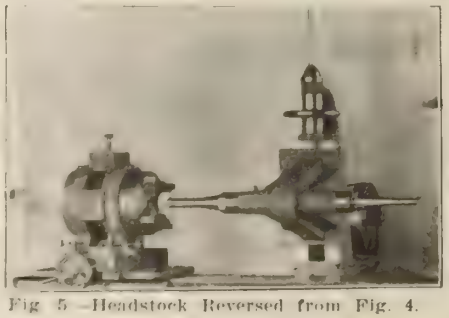


Fig. 5.—Headstock Reversed from Fig. 4.

in base plate, as shown in Fig. E. Sixteen diameters of spindles are made from stock of 3" diameter, and the ends reduced to the diameter of the hole to be ground. The grinding spindles have a

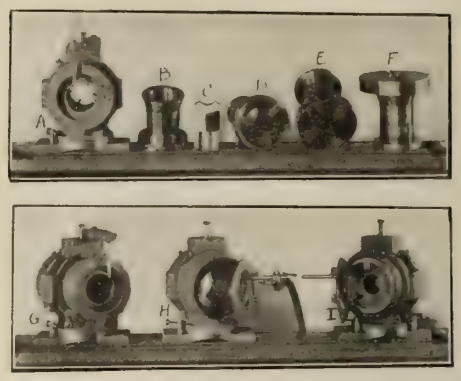


Fig. 6.—Swivel Head Stocks, Bath Grinder.

large body of metal at the back end, which absorbs the vibration of the high speed grinding spindle, and absorbs the heat generated at the small end of the spindle, and permits the grinding spindle to run at a higher speed. The bearings are made from Tobin Bronze, and the grinding spindles hardened, ground and lapped. There are no oil holes in the body of the spindles. They are oiled from the back end, which makes them dust proof, and the machine does not have to be moved out of position to oil them.

Fig. 8 shows application of 8 grinding wheels, and method of holding and grinding a divided gear on a gear-hobbing machine, internally from the back end and the front end at the same time, externally on the periphery and side.

ADVANCE IN MACHINE TOOLS.

The developing of machine tool construction and its advances in recent years, was the subject of a lecture given last night before the mechanical section of the Canadian Society of Civil Engineers by Colonel Alex. Bertram, of

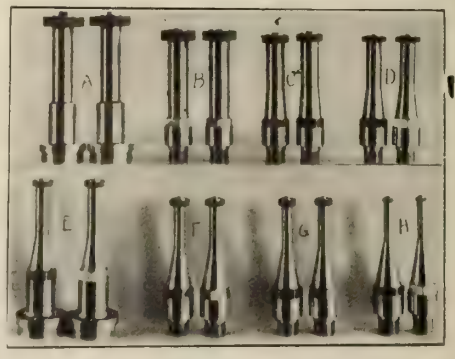


Fig. 7.— Internal Spindles.

John Bertram & Sons Co., Dundas. The chair was occupied by Mr. H. H. Vaughan, and there was a large attendance of members. The lecture, which was illustrated by lantern slides, demonstrated the advance made within the last half century and more particularly in the last decade in machine tool invention.

POWER EQUIPMENT & APPLICATION

Expert Descriptive Articles Dealing with Selection and Purchase of Most Suitable Power Equipment for All Purposes, its Proper Application, Installation, Operation and Treatment.

GEARS AND GEARING*

By A. E. B.

TOOTHED wheel gearing is used to a lesser or greater extent in a variety of circumstances for the transmission of motion and power from one shaft to another. It has the advantage of precision over belts and ropes in this respect.

In its design and arrangement, the idea aimed at, is to have the minimum of friction, an absence of noise, a constantly equal power transmitted and the principle of two plain cylinders rolling on each other by the friction of their surfaces, approached to as closely as possible.

The diameter of the pitch circle, or in other words what would be the diameter of a plain cylinder, is reckoned as the wheel diameter, and as a result when two wheels gear properly, their pitch circles meet and roll upon each other.

Pitch of Gears.

The most important measurement of a gear is known as the pitch and there are two distinct systems of determining it, namely, the circular pitch system and the diametral pitch system. The circular pitch is the distance between any point in a tooth and the corresponding point in the next tooth measured along the pitch line. The diametral pitch is the ratio of the number of teeth in a gear to the pitch diameter. For example, a gear of 12-inch pitch diameter having thirty-six teeth would be known as a three-pitch gear. The advantage of this system is to avoid uneven diameters, as would follow by making a thirty-six tooth gear of one inch circular pitch. The pitch diameter in such a case would be 11.46 inches.

$$\frac{36 \times 1}{3.1416} \text{ equal } 11.46.$$

Cast iron and mortise gears are measured on the circular pitch system and cut gears on the diametral pitch system.

Fine pitch wheels have a smoother and more uniform action than coarse ones, therefore the pitch of teeth should be designed to secure this operating condition as far as consistent with the power to be transmitted.

Methods of Manufacture.

Touching methods of manufacture, the following may be taken as those commonly adopted:

Cast gears, the teeth of which are formed by the pattern and cast to shape.

Cut gears, the teeth of which are cut from a solid casting by standard gear cutters.

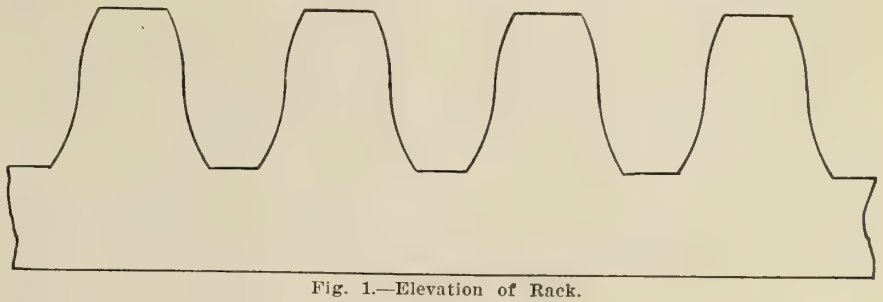


Fig. 1.—Elevation of Rack.

Mortise gears, the teeth of the larger of the pair having mortises in the rim into which are driven maple or beech teeth well seasoned, the teeth being keyed tight on the inside of the rim and accurately dressed to shape.

Types of Gears.

The principal types and forms of gearing in general use may be classified as follows:

Spur gears, the axis of whose shafts are parallel. Oblique tooth spur gears, whose teeth are at an angle with their shafts; known as double helical when the teeth are also angular in shape, and have their two ends on a line parallel with the shaft. They are known as single helical when the teeth are straight. This class of spur gear runs much more smoothly than the ordinary.

Internal spur gears, have the teeth on the interior of the rim and pointing in the direction of the shaft. This class of gear is the strongest for a given pitch, and is used largely to economize space. Internal spur gears rotate their shafts in the same direction.

Elliptical spur gears, have their shafts off the centre.

House tooth spur gears, have a portion of their teeth encased between flanges.

Bevel gears have the axis of their shafts on the same plane and at right angles.

Mitre gear is the term used when both are of the same size.

Angle gears have the axis of their shafts on the same plane and at an angle other than a right angle.

Worms and worm wheels have the axis of their shafts at an angle but not on the same plane. A movement of the wheel equal to the circular pitch results in a complete revolution of the worm.

Rack and pinion gears are used for the purpose of changing their relative position to each other by a parallel movement.

An intermittent gear derives its name from the intended purpose to stop the driven gear for any given period of time. It is accomplished by forming the driver without teeth at definite intervals desired.

Wheel and pinion are the names applied to the larger and smaller units constituting one pair of gears.

*Part I. of the third article of the series of Power Transmission Equipment, Operation and Efficiency Subjects.

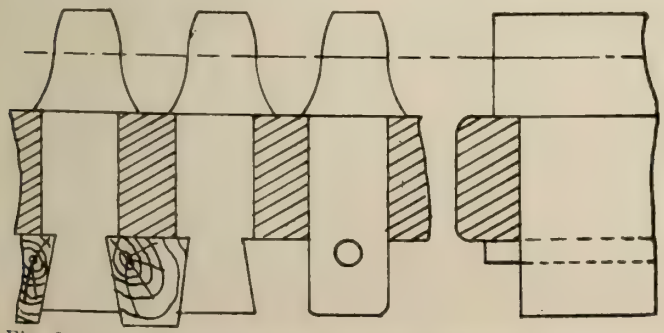


Fig. 2.—Mortise Teeth showing Wedge and Steel Pin Attachments

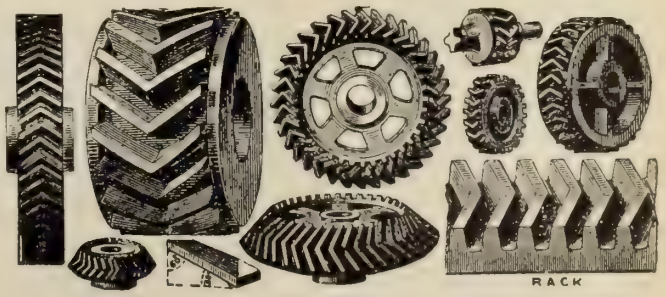


Fig. 3.—Miscellaneous Double Helical Tooth Gears.

Two gears are said to mesh when their teeth are engaged properly.

Miscellaneous Definitions.

The pitch line or circle is the path described by that point of intersection between the teeth where the speed of both gears is equal. The pitch line of bevel and angle gears is measured at the largest diameter.

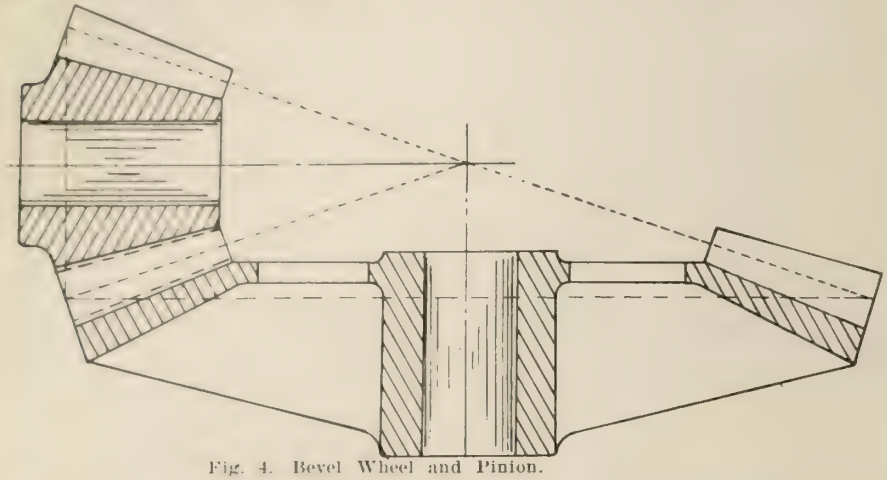


Fig. 4. Bevel Wheel and Pinion.

The addenum circle is the path described by the extreme outer end of the teeth.

The addendum is that portion of the teeth between the pitch line and the addendum circle.

The root circle is the path described by the extreme inner end of the teeth.

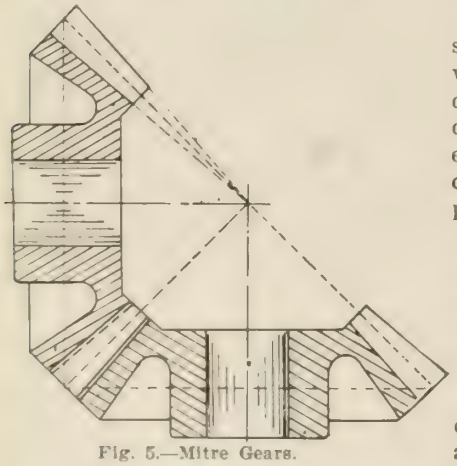


Fig. 5.—Mitre Gears.

The root is that portion of the teeth between the pitch line and the root circle.

The outside diameter is measured inside the addendum circle.

The root diameter is measured inside the root circle.

The pitch diameter is measured inside the pitch line.

The pitch radius is the distance between the centre of the gear and the pitch line.

The line of centres is the distance between the centres of a pair of gears in mesh.

The length of tooth is measured between the root circle and the addendum circle.

The breadth of tooth is measured across the face of the gear.

The thickness of tooth is measured along the pitch line.

The space is the distance between the teeth measured on the pitch line.

The backlash is the difference between the thickness of tooth and the space.

The end clearance is the distance between the addendum circle of one gear and the root circle of the other when in mesh.

The backing of bevel gears is the distance between the pitch circle and the extreme end of the hub.

Speed of Gears.

The speed at which gears may be safely run consistent with moderate wear and tear varies considerably in the opinion and practice of operators and designers. The following are however examples of what may be considered common and reliable performance in feet per minute:

Ordinary cast iron wheels, 1,800.
Helical cast iron wheels, 2,400.
Mortise wheels, 2,400.
Ordinary cast steel wheels, 2,600.
Helical cast steel wheels, 3,000.
Cast iron machine-cut wheels, 3,000.

Gears made of rawhide or fibre can be operated safely at a higher speed and are generally superior for wearing qualities, although not as strong as metal gears.

NEW STEEL PULLEY.

A new steel pulley is being placed on the Canadian market by Schuchardt & Schutte of Montreal, Que., which has several interesting features. The pulleys are all steel and are light and strong.

The rim is composed of two layers locked together. The ends overlay the arms and bolts which hold the two halves of the pulley together, pass through the hole, which prevents the danger of stripping rim and ensuring great strength to the arch forming each half pulley.

The construction of the arms combines great strength with light weight. In all pulleys eighteen inch and upwards the arms have openings to reduce weight. Pulleys thirty-six inch and upward have four arms. All sizes of pulleys have one uniform bore for taking bushings of one uniform outside diameter for different sizes of shaftings. Stamped steel bushings are supplied to adapt the pulleys to smaller diameters. These bushings have a very fast grip on the shaft and eliminate to a great extent the danger of turning loose. No rivets or bolts are used in the construction of the pulleys.

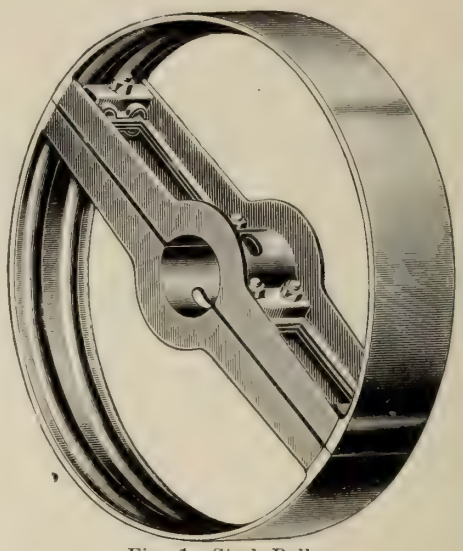


Fig. 1.—Steel Pulley.

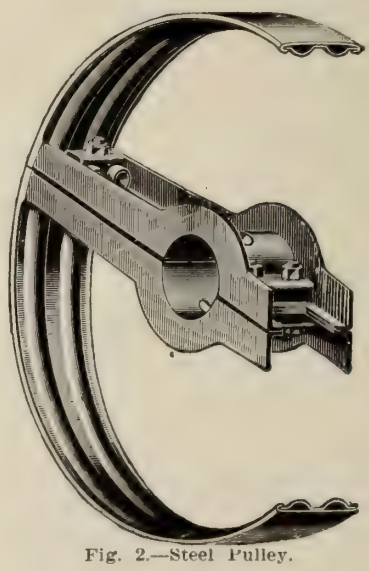


Fig. 2.—Steel Pulley.

The pulleys are manufactured in very large quantities with very heavy presses, a special die being used for each size. Their accuracy in running true is obtained by rolling all the steel plate, entering into the manufacture of these pulleys before it is used, with the aid of very heavy rolling mills, securing an accuracy of .00039 in.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

PRODUCE.

By Service.

The office is made to sell and the factory to produce. These are the two general divisions. If this be so, why not make the factory produce and produce efficiently without any peak loads. "How shall I do it?" is the natural question. Some managers and superintendents have tried some schemes and some others. Some have been successful, and some haven't. Some have tried schemes of rewarding men, some have installed systems, yet the factory failed to produce more than previously.

The trouble is that the business managers fail to use the knowledge they acquire in the management of their own plant. They know of obstacles and pitfalls into which others have fallen but do not try to avoid them. Men do not like being told so but it is true, nevertheless.

The writer had to learn by experience and only a fool will not listen to experience. It is easy to point to failures. It is easy to point out where men may fail but that is not the purpose of this letter. ITS OBJECT IS TO TELL MEN HOW TO FORESEE, AVOID AND OVERCOME OBSTACLES AND MAKE THE FACTORY PRODUCE.

How to Produce.

"NEVER PUT OFF 'TILL TO-MORROW WHAT YOU CAN DO TO-DAY." It is the easiest thing in the world to pigeon-hole seemingly unimportant things and say, "I'll attend to that to-morrow." Better do away with the roll-top desk if you use it for that purpose. It was never intended for that. Finish everything as it comes and you will be surprised what it will mean in the way of production.

2. STUDY MEN. You are in constant touch with the men. Your position as manager, superintendent or foreman calls for it. Sometimes a man comes into the office asking for a raise. You are busy at something else and dismiss him with a curt remark. You have offended him and his rate of production is lowered. If you are busy, say so. Tell him you'll talk about it to-morrow and if he isn't worth a raise give him something to hope for. One reason why Clarence S. Funk rose from a $10 a week clerk to the general managership of a $140,000,000 corporation was because he studied men. Mr. Funk says: "They must be treated as friends and co-workers." Give them some responsibility, make the men self-reliant yet obedient. Teach them to say yes or no. Encourage them. Be absolutely fair.

You can get the men to take a partner's interest. Large companies are beginning to realize it. Libraries, hospitals, educational classes, etc., are not furnished and financed for pleasure or philanthropy. It is a business proposition. Men appreciate it and it has a marked effect on the production. "First Aid" means that men are promptly attended to in the case of injury and very often no time is lost by them where otherwise they would be greatly weakened and be on the sick list for some days seriously affecting the organization and output.

PRODUCE!

One Dollar that is Earning Interest is More Valuable Than Two Dollars That are Earning None—

A Humble Talent that is put to Use is Worth More than Genius Lying Idle—

A SINGLE IDEA THAT IS CONVERTED INTO ACTION IS DOING BETTER SERVICE THAN A THOUSAND IDEAS THAT ARE UNEXPRESSED—

A Menial Job that Brings in Real Cash Pays More Bills Than the High-salaried Position in Prospect—

The Pennyworth that is Sold Spells Bigger Profits than the Dollarworth that Stays on the Shelf—

A Bird in the Hand is Worth Two in the Bush—

SAY IT WITH AS MANY FRILLS AS YOU WANT, THE POINT IS THIS:

DO SOMETHING. DELIVER THE GOODS. PRODUCE!

—System

INTERFACTORY TRANSPORTATION. Did you ever enter a shop and see five of six men moving a large casting from the foundry to the machine shop, or from the machine shop to the shipping room. A great deal of waste time and effort can be entirely eliminated by a good crane service or an industrial track connecting the departments. One man could then handle large castings and the time of the other four or five men could be used to good advantage to increase the output of the plant.

In shipping it is advantageous to have the top of the car level with the floor unless cranes may be used. The direct loading of small castings or boxes will be found to be more quickly than by a crane. Some plants have to transport the product of the factory to the station by waggons or motor trucks. The lowered portion will be found to be of equal service here when the trucks are the same level as the shipping floor.

Scientific Management.

The fact is that all the points that could be brought up, would fill volumes. The manager must do some "digging" in his own plants. There are efficient and inefficient ways of doing things. The methods should be investigated and corrected. Perhaps there is insufficient light, the tool room is not convenient, there is insufficient equipment, or cuttings that could used to manufacture something and produce a profit are thrown under a boiler. There are a thousand and one wastes that should be investigated and eliminated. The scientific manager will find them out, and plan the work.

A locomotive under one master mechanic may cost $100 to repair but be back in the repair shop in a month. A successor may repair it at $125 and it will stand hard service for three months. Evidently the second one has discovered the secret of wise expenditure. MAKE EVERY DOLLAR BUY ITS FULL EQUIPMENT IN STANDARD PREDETERMINED SERVICE AND IN THE FACTORY MAKE EVERY DOLLAR COUNT IN SECURING INCREASED EFFICIENCY.

In plaster of Paris molding, the usual difficulty is in not completely drying the mold. Unless it is "bone dry" the metal will not fill the mold as the steam produced from the dampness will blow the metal away from the surface of it. In order completely to expel all the moisture from the mold, it must be heated nearly red hot. It should also be used while warm, in order to prevent absorption of moisture from the air.

Metals should not be melted too rapidly or certain portions of them will become overheated before the rest arrive at the melting temperature. The best condition is when all of the metal arrives at the melting point at practically the same time. This is difficult to realize in practice, but should be attempted.

THE FACTORY TELEPHONE.

By Efficiency.

THE factory telephone which formerly was considered a luxury is now regarded as a necessity in every business as a time saver. The present shop organization includes automatic telephones for communication between all departments.

The very nature of the modern machine shop organization with its various departments covering a large ground area demand that some quick method of communication be installed that will put every department in close touch with any and every department and IT SHOULD NOT BE NECESSARY FOR THE FOREMAN OF, SAY, THE MILLING DEPARTMENT TO GO TO THE FOUNDRY TO ASCERTAIN WHY CERTAIN CASTINGS REQUIRED FOR A RUSH ORDER HAVE NOT REACHED HIM. HIS TIME IS TOO VALUABLE TO BE THUS WASTED. Again, the shipping department, located perhaps in a remote part of the works, should be in as close touch with the superintendent as the drafting-room just outside his office.

The value of the automatic telephone is shown in its low initial cost and cost of upkeep and in the saving of time, thus increasing the efficiency of high paid officials. Formerly when the superintendent wished to communicate with a departmental foreman, he had to hunt him up in his department and deliver a minor instruction that could as easily, have been delivered by telephone.

The reverse is also the case. Formerly when a foreman wished to find the superintendent, he traveled to the superintendent's office and nine times out of ten found him out, as the superintendent's duties took him all over the plant. Then he hunted for him in the stock room, foundry or some of the other departments, at last discovering him after the lapse of half an hour or more. During this time the department was without a foreman. Now with the telephone, the foreman need not leave his department. He presses a button on the telephone and at once gets into touch with the superintendent, whether he is in his own department or another.

By the factory telephone not only may the superintendent be located in a hurry, but also any others who may be making a tour through the works. In a few moments all the stations can be called up if necessary, the desired persons located, and any communication transmitted or information obtained with promptness.

A superintendent's call instrument may be used at any station in connection with the automatic factory telephone to enable a general call being given throughout the system for the superintendent who may be in one or another of the departments. For this purpose there is required a button in each set, or a separate push button, for each station from which it is desired to send in a general call for the superintendent; a call bell for each department outside of his own in which the superintendent is likely to be engaged; a battery and a pair of wires in the cable connecting the different stations, or a twisted pair of No. 19 B. & S. gage rubber covered copper wires.

Operation.

In the automatic factory telephone, connection between stations is established by simply pressing a button. One button is mounted on the set for each of the stations connected to the system. A name plate is provided with space opposite each button for designating the name or location of the station



The Automatic Office Telephone.

associated with the button. The same button is used both for signaling the station desired and for establishing the telephone connections. The operation is therefore very simple.

To make a call, press way down the button opposite the name of the station desired; this places the key in its ringing position. Then release the pressure on the button and the key will return to its talking position. Remove the receiver from the hook and place it to the ear.

To answer a call press the button designated "Ans."; remove the receiver from the hook and place it to the ear. After a conversation is finished it is not necessary to release the button as it is automatically restored when the next connection is established.

DUMMY WAITER AND SPEAKING TUBE SAVES MONEY.

By M. E. D.

The dummy waiter and the speaking tube are finding an increasing use in the factory. One plant with which the writer is familiar has a speaking tube between the store room and cost clerk's office. In another there is a speaking tube between the order and stock departments. Some time ago the National Cash Register installed a dummy waiter between the machine shop and the stores department on the floor below. The stock is sent up by the man in charge of that department without the necessity of another man or delays in delivery.

In the machine shop of the Smart-Turner Machine Co., Hamilton, a combination of this system has been installed by R. McKechnie, the superintendent. In order to provide larger space for shop equipment, the tool room and stock departments were removed to the galleries. When a workman required stock or a tool, he had to climb a stair to the gallery, requiring considerable time during which his machine was idle.

The difficulty was solved by installing in a convenient position, a dummy waiter and speaking tube. Now when a workman requires stock he sends up a properly signed requisition, or if he requires a certain tool he sends up his check and calls up the man in charge of the tool room. If any explanations are desired they may be made by means of the speaking tube. The tool-room and stock departments are adjacent and the one installation serves for both.

ALUMINUM BRONZE.

An article in the "Brass World" by E. S. Sperry states that aluminum alloys with copper in all proportions and homogeneous mixtures are produced. When the Al. reaches beyond 10 p.c. the bronze begins to become brittle, and a 12 p.c. mixture is so hard that it may be used for hard dies. The mixture generally used for sand casting is the 10 p.c. alloy It is hard and tough and answers all the requirements of a strong metal. The greatest difficulty in the way of casting Al.-bronze is its oxidation when melted. The only method by which it can be cast in a commercial manner is to prevent its being agitated while the pouring is taking place. The more quietly it can be poured the smaller the quantity of dross. Dross which forms in melting may be skimmed off, but that which forms while the pouring is taking place enters the casting. Another difficulty in casting the alloy is the shrinkage of the same; but by the use of sufficiently large risers and freedom from sharp corners in the casting with an ample gate, any shrinkage may be readily overcome. The toughness of Al. bronze is probably greater than that of any metal except steel. All bronze works hot better than Cu. as it is softer at a red heat. At the same time, it is not black-short like the Cu. and Zn. alloys.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

PITTSBURGH CONVENTION.

Owing to the big demand for exhibition space, the Foundry & Machine Exhibition Co., successor to the Foundry & Manufacturers' Supply Association, has been obliged to arrange for additional space in the Western Pennsylvania Exposition Society buildings, Duquesne Way, Pittsburg, for the exhibition of foundry and pattern shop equipment, machine tools and supplies, to be held in May.

It has also been decided to open the exhibit Tuesday, May 23, instead of May 22, as originally arranged, and to continue the exhibition over the first four days of the following week. These changes were decided upon at a meeting of the executive committee of the Foundry & Machine Exhibition Co., at the Fort Pitt hotel, Pittsburg, Saturday, March 4. Originally the committee arranged for a total of 28,000 square feet of exhibit space in the Western Pennsylvania Exposition Society buildings and 23,000 square feet of this space was sold within two weeks from the time bids were opened. At the meeting, March 4, the committee made arrangements for the whole of the main floor of the larger building, which will give a total of 40,000 square feet of exhibit space, which is about 8,000 square feet more than used in past years.

The decision to continue the exhibition into the second week has been made on account of the annual meeting of the American Society of Mechanical Engineers, which will be held in Pittsburg that week.

The annual conventions of the A.F.A., the A.B.F.A. and the American Foundry Foremen's Association, will be held during the first five days. The meetings and exhibits should attract large numbers of men interested in the manufacturing industries and it is hoped a large number of Canadians will avail themselves of this opportunity of seeing side by side the various types and makes of molding and pattern-making machinery and machine tools. The exhibit will be open from 8.30 to 5.30 daily and two or more evenings subject to the decision of the management.

Some men are so full of faith in themselves that there is no room left for ability.

The man who is always looking for precedents must keep his face turned to the rear.

PITTSBURG CONVENTION PROGRAMME.

American Foundrymen's Association.
American Brass Founders' Association.
Associated Foundry Foremen.
Foundry and Machine Exhibition Co.

PITTSBURG FOUNDRYMEN'S ASSOCIATION will properly entertain those attending the Conventions, and have made special arrangements for the visiting ladies.

PRELIMINARY PROGRAMME.

(All at EXPOSITION BUILDINGS, unless otherwise stated.)

MONDAY, May 22—2 p.m.—Registration only.

TUESDAY, May 23—9 a.m.—Registration.

10 a.m.—**Joint Session**—Addresses of Welcome—Papers on:—

Production Cost.
Economic Foundry Insurance.
Uniform Contracts, etc.

2 p.m.—**Separate Sessions.**

A. F. A.—Papers on:
Unloading Methods.
Use of Borings in Cupolas.
Effect of alloys in Cast Iron.
Permanent Moulds, etc.

A. B. F. A.—Papers on:
Vanadium in Non-ferrous Alloys.
Determination of Nickel in Bronzes.
Pouring High-grade Bronzes, etc.

7 p.m.—**F. & M. E. Co. — Exhibit** — Open throughout the week during the day, and Saturday evening, May 27th.

WEDNESDAY, May 24—9.30 a.m.—**Joint Session**—Papers on:
Rotary Blowers.
Foundry Construction.
Heating and Lighting Systems.
Pattern Making.
Molding Machines, etc.

2 p.m.—**A. B. A. Steel Session**—Papers on:
Acid and Basic Open Hearth Processes.
Electric and Converter Furnaces for Steel Castings.
Effect of Vanadium and Titanium on Steel.

2 p.m.—**A. B. F. A. Session**—Papers on:
Corrosion of Brass Foundry Products.
Pyrometer and the Aluminum Foundry.
Non-ferrous Foundry Economics.
Equilibrium Diagrams, etc.

2 p.m.—Individual Plant Visitation.

6.30 p.m.—**Dinner**—Pittsburg and Associated Foundry Foremen. (Will announce place later.)

THURSDAY, May 25—**Joint Session.**

9.30 a.m.—Papers on:
Molding Sand.
Use of Alloys.
Shot in Castings, etc.

1 p.m.—Train Excursion to Foundries and Steel Works (Pennsylvania—Union Station.)

8 p.m.—Entertainment by Foundry & Machine Exhibition Co. to Members of all Associations and their guests attending the Conventions.

FRIDAY, May 26—**Separate Session.**

9.30 a.m.—Election of Officers and reading of papers.

3.30 p.m.—Pittsburg and Cincinnati ball game at the Million-dollar Forbes Field.

6.30 p.m.—Subscription Dinner, open to all who attend the Convention or Exhibition. (Will announce place later.)

SATURDAY, May 27—The **Exhibition** of the Foundry & Machine Exhibition Company will be open throughout the day and evening. Exhibition open daily, May 29 to June 1.

Convention Executive Committee.

Joseph T. Speer, Chairman.
F. H. Zimmers, Secretary.
J. S. Seaman, Finance.
H. E. Field, Convention.
W. A. Bole, Plant Visitation.
Eliot A. Kebler, Reception.
G. P. Bassett, Jr., Ladies' Entertainment.
E. D. Frohman, Ball Game.
W. B. Robinson, Press.

LARGE STEEL CASTINGS.

By Kelpie.

A few weight particulars of steel castings used in the construction of the White Star steamships "Olympic" and "Titanic" will doubtless be of interest to readers of Canadian Foundryman. The stern frame, of special quality mild steel and weighing 70 tons, is of hollow or dished section in two pieces 63 and 37 feet 4 inches long respectively. In casting the main piece of it, nearly 95 tons of molten metal were brought into service. The after cross arms weigh 74 tons, the forward cross arms 45 tons, and the rudder 100 tons.

YELLOW BRASS MIXTURE FOR PLUMBERS' BRASS GOODS.

For high steam pressure yellow brass does not give good results, and cannot be used. It leaks and becomes brittle at such a point, and is not sufficiently non-corrosive for some kinds of work. A red metal, therefore, is necessary for such work. For plumbers' brass goods, such as faucets and cocks, or similar work, yellow brass can be used to a good advantage in spite of opinions to the contrary, and is much cheaper than red metals. Some manufacturers maintain that although a yellow brass mixture is cheaper than a red one, the castings made from it are practically no cheaper than those made from red metal on account of the greater percentage of loss; but this has not been found true in practice, and evidently has been brought about by the use of a poor mixture.

A yellow brass mixture for making plumbers' brass goods should not contain too much spelter, or the castings will contain dross, and leak. The following one has been found very satisfactory for such work, and is extensively used:

Copper	70 lb.
Zinc	25 lb.
Lead	3 lb.
Tin	2 lb.

The tin is necessary for producing the desired stiffness and hardness, and the lead will impart the free cutting qualities required in brass to be worked on automatic tools. Care should be taken not to exceed the quantity of lead given.

The preceding mixture, according to the "Brass World," will give hard, strong castings, and will cast soundly and run freely.

Description of the Doherty Process of Ironfounding

By Cupola

Being a Few Notes Taken of a Paper Read By W. A. Grocock, Toronto, at a Meeting of the Central Railway and Engineering Club Held in Their Rooms, Prince George Hotel, Toronto, on Tuesday Evening, 21st March, 1911.

MR. DOHERTY, the inventor of the process bearing his name, is a Canadian by birth, having been born in Sarnia, Ont. He has devoted the major portion of his lifetime to ironfounding investigation, with a view to determining if possible, some reliable data by means of which accurate results may be forecasted.

It is well known to all engaged in foundry work, that variation of quality is found in two or more sample castings under test, in spite of equal provision made by every determinable and known condition or circumstance, to have them alike.

Uncertainty of result seeks a remedy in the right amount of air at the blast, amount and suitability of fuel, melting

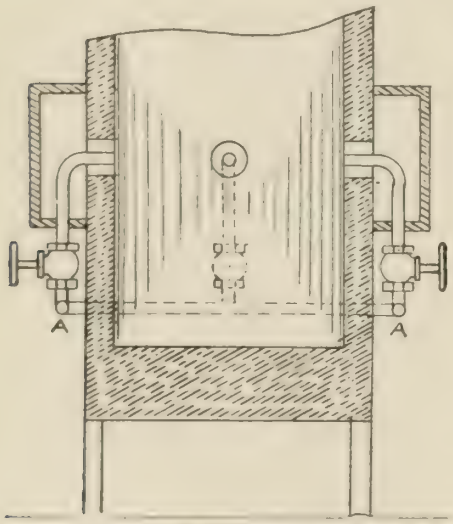


Fig. 1.—Lower part of Cupola with Doherty Process Attachment.

temperature and introduction of some other factor to co-operate with these, in dealing with the variety and physical composition of the mixture to be melted.

Explanation of Process.

In the Doherty process, the factor introduced is that of dry or slightly superheated steam. Referring to Fig. 1, the steam pipe A. A. is carried around the cupola as shown, and from it, ¼-in. branch pipes with regulating valves enter the blast chamber and are directed through each tuyere.

To prevent condensation, the steam piping is covered with non-conducting composition, and the pressure of steam used has been from 80 to 90 pounds per square inch.

Results Attained.

The effect of the steam jets is to generate hydrogen gas which absorbs and carries off the sulphur present, and thereby ensures a more homogenous, softer and stronger casting.

The presence of sulphur as is well known, contributes largely to the comparative weakness of castings. This feature of easy riddance admits of the use of materials for cupola purposes, more or less high in that element, and is simply a question of operation and jet regulation to deal with it in abnormal quantity.

It was also shown by Mr. Grocock that material for the melt, high in oxide gave a higher return in iron cast by the Doherty process than was ordinarily attainable. In other words less oxide went to slag, and more of it was saved.

Further beneficial results claimed for the process, are a cleaner and longer life to the furnace, with the practiability of the use of scrap of immaterial quality and quantity.

Personal Experiences.

On assuming charge of the foundry of a bridge works at Garston, Liverpool, England, Mr. Grocock was informed that this department showed a loss of $5,000 for the year previous. With a commendable confidence in himself and the Doherty process, which by the way, he had successfully operated in Rangoon, British Burmah, Mr. Grocock set himself steadfastly to make good.

That he and his process succeeded is borne out by the following results. The $5,000 loss was turned into a $7,500 gain, realized by an output increase, which gradually developed until the corresponding twelfth month showed an increase of 160 per cent. Factors conducing to the achievement were the reduction of wasters from 18 to .9 per cent. and back scrap from 40 to 8 per cent.

The metal produced, approached closely to that of malleable cast iron, being uniform, close grained and silver grey in color. Test bars from it showed with a load of 3,360 pounds on centre, a permanent set of 1 inch without fracture.

Costs and Opinions of Users.

The Doherty process involves an extra percentage of limestone for flux purposes being added, but the additional expenditure in this respect is limited to about 1 cent. per ton.

Cupola and machine shop savings have been shown to amount to $4 per ton. A superior casting free from that hardness which worries and increases cost of machine work, is by the Doherty process attainable.

Among different concerns using the system may be instanced the Goldie & McCulloch Co., Galt, Ont. Their commendation or appreciation is to be found in the fact that their experience has been satisfactory. They have found that more scrap and less pig iron can be used, and that the casting is softer, tougher and stronger. Permanent adoption of the process has been made by them.

The discussion of the subject by various members at the close of the paper elicited the information that the process has been in use off and on for about 10 years, and that its adoption has not been as general as might have been expected due to the fact perhaps that

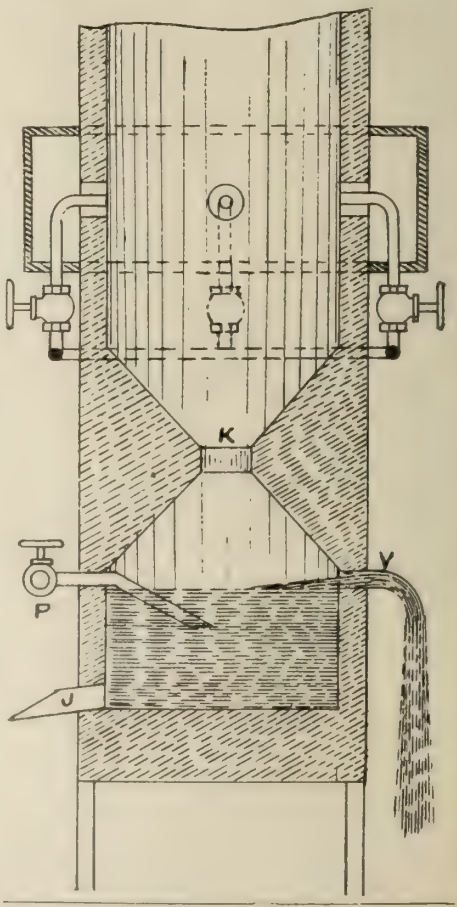


Fig. 2.—Lower part of Doherty Iron and Steel Cupola.

scrap, to which it has special application, is something like $1 per ton dearer than pig iron.

Combined Iron and Steel Cupola.

Fig. 2 shows the latest Doherty invention; a combined iron and steel cupola which has for its aim the conversion of molten iron into steel, suitable for machinery purposes to which cast iron is at present generally applicable.

The upper portion of the figure is equipped with the Doherty process as in Fig. 1, and is used for melting the iron. The bottom of the chamber is coned to form the neck K, through which the molten metal passes to the lower chamber. Here, compressed air is blown into and under the iron by means of the connection P, the effect of which is with proper regulation to convert the metal into steel of any desired constituency.

The slag is drawn off at outlet V, and the resultant metal at J.

Mr. Grocock treated the whole subject with the confidence of one who knows the ironfounding business thoroughly, and his commendation of the "Doherty Process" was marked by sincerity of belief in its superiority over the ordinary method.

BRASS MELTING FURNACE.

By Fettler.

The sketch fig. 1 shows in detail the arrangement and equipment of a useful furnace for melting brass and alloys of a like nature. Its principal dimensions internally are 15 inches square by 28 inches deep. The flue hole is 10 by 7, the chimney 10 inches square inside and at least 15 feet high.

It is built of ordinary brick, lined with firebrick, and has front fire-bar bearer moveable, to permit of its sliding forward and allow the bars to drop down as required.

Such a furnace will melt 80 pounds of metal quickly and easily.

The tongs for pouring the metal are shown at A, and those for lifting the crucible off the fire at B.

The Melting Process.

The following is a description of the melting process. The crucible is placed over the fire, upside down until properly heated. When this has been effected, it is turned right end up, made to rest with its bottom on a firebrick clear of the bars, and packed round with coke to steady.

Copper cut into small pieces is then placed in the crucible and melted, after which tin is added, melted and mixed.

To test the proper casting heat, a piece of zinc is dropped into the crucible. If it flares up at once the metal should be poured, if not, the proper casting heat has not been reached.

Previous to pouring, the dirt and rubbish is skimmed off the surface of the molten metal.

As soon as the metal is poured into the mould, the moulding boxes are opened and the castings sprinkled with water to ensure quick cooling. Quick cooling leaves the metal softer and more uniform than if slowly cooled. Further, the metals forming the alloy have a tendency to separate, and as a consequence

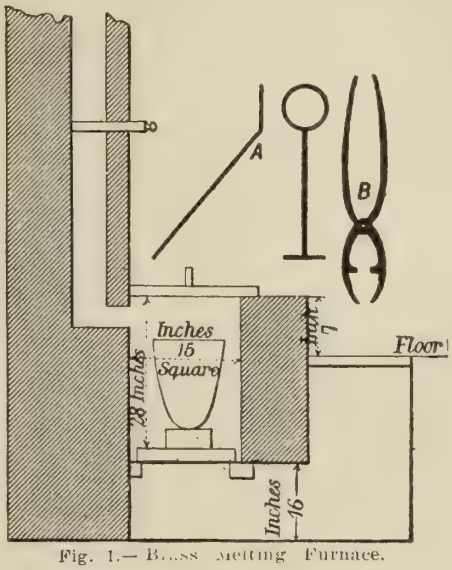


Fig. 1.— Brass Melting Furnace.

the heavier would be found at the bottom of the mould.

In melting old brass, the addition of tin may be unnecessary, although a small addition of zinc is found beneficial.

When a mixture of part old brass and part copper is melted, tin should be added in proportion to the new copper, and zinc in proportion to the old brass.

The strength of the metal varies considerably, and depends to a large extent on its manipulation both in the crucible and in the casting.

MOTOR TRUCKS IN MANUFACTURING TRADES.

By K. Campbell.

HANDLING an output of a factory, receiving raw material and moving machinery around the plant and yard is often done at a great inconvenience in some plants. If they are not adjacent to a railway nor fully outfitted with yard cranes, it is rather inconvenient and sometimes costly to handle the materials used in the plant or shipped from it.

It would be possible to pick examples of work of self-propelled trucks in almost every line of manufacture. Many forms of bodies have been designed to facilitate the rapid loading and unloading, with the object of keeping the machine actually running as many hours in the days as possible, on the same principle that every factory manager keeps his machinery constantly in operation to increase the earning capacity of the investment.

The market affords power trucks of every capacity, from one ton to ten tons, with speed limits of from five miles to fifteen miles an hour, loaded. There is every possible choice for the purchaser in the matter of power, type of engine or battery, form of transmission and final drive, in tire and other equipment and in price.

Almost any motor truck can do the work of three or more waggons and the necessary teams to haul them, and there are many services in which they are proved by records to be doing several times this proportionate amount of work, with all the saving that this represents.

Figures carefully compiled by The Gas Engine show that ten three-ton gasoline trucks, all covering forty miles a day and operating 300 days a year, can be maintained and operated at an average daily cost per machine of $9.75. The items contributing to this average are as follows:

Fixed Charges Per Year on One Truck.	
Interest, at 6 per cent on $3,000, cost price	$ 180.00
Depreciation, at 20 per cent.	600.00
Insurance, at ½ per cent.	15.00
Storage, 200 sq. ft. at 50c.	100.00
Total	$ 895.00
Add 20 per cent. for two spare machines	179.00
Total	$1,074.00

Dividing by 300, the number of working days in the year, this gives $3.85 per day.

Running Expenses Per Day for Ten Trucks—	
Wages of ten drivers at $2.50 for ten hours	$25.00
Wages of repairman, helper and washer	7.00
Gasoline, 80 gallons, at 12c.	9.60
Lubricants, at 1c per mile	4.00
Maintenance, at 10 per cent a year	10.00
Superintendence	3.20
Incidentals—light, heat, tools, waste, etc.	2.87
Total	$61.67
Average running expense per truck	6.17
Fixed charges per truck per day...	3.58
Total maintenance and operating ing cost	$ 9.75

Calculated in the same way, it is shown that a service of ten five-ton trucks can be operated at an average daily cost per vehicle of $11.48.

Such figures can only be taken as a fair guide to the probable cost of an installation. They are, if anything, rather high in the light of results obtained by some users, but conditions of work, usage and care vary so much with different installations that no figures can be applied to all.

MELTING IRON IN CRUCIBLES.

By W. J. May.

The cupola is generally used on account of its cheapness in melting iron; from 10 to 12 pounds of good coke melting 100 pounds of iron against 50 to 100 pounds of coke being required for the same melt in a crucible furnace with ordinary draught.

With an ordinarily well-built furnace from forty to sixty pounds of coke would be used, according to whether early or late fires are being dealt with, the latest melts naturally using less fuel than the earlier ones; but even with a ten-hour day during which perhaps seven melts are obtained, the average consumption of coke will be close on fifty pounds of foundry coke per hundred weight of metal melted.

With coke at $10 per ton this means that cupola melting costs 6 cents per hundredweight of metal, while crucible melting costs 25 cents per hundred. weight for fuel alone.

Against this there is generally a better class of metal obtained and the iron thus melted is cleaner, and produces better castings owing to its picking up practically no impurities during melting. Still, unless the work done is especially particular, it scarcely pays to expend so much on melting. If we have badly built furnaces, we get larger fuel consumption and much slower melting, with of course, increased costs.

Furnace.

Carr's patent crucible furnaces when properly fixed will be found to give better results than the built furnaces; but these often prove expensive in fuel if the flue and chimney part of the business is badly designed; for while as furnaces they are better than the others they still need the chimney arrangement to be good, or they will eat up fuel.

All natural-draught furnaces depend on the chimney and connecting flues for their efficiency, and it is useless to alter the furnace when the chimney is at fault.

Where economy is considered, a 400 lb. Morgan tilting furnace of the A or D type would give the best results both in first cost and in melting. Soft grey iron takes only about twenty-eight pounds of hard coke per hundredweight of iron on an average with a full day's work, provided there is electricity or some other available motive power at command. There is no chimney or expensive pit to build, but only an iron flue-pipe to convey the products of combustion outside the workshop.

Probably only small castings comparatively would have to be cast in a works foundry of small size, the large castings being brought in from outside, and this would mean that a portable furnace which needs no deep pit, and in addition no expensive chimney, would be more economical in all ways than the usual form of built furnace.

In most cases there would be a saving in crucibles as well, because in the Morgan furnaces the crucibles are fixed in position, and need renewal only when worn out in the actual melting work, and are not, as is the case with ordinary furnaces, knocked to pieces with the tongs and other tools, which are very often badly fitting and altogether too roughly made.

The great point in fitting up a foundry for crucible melting is to ensure a moderate cost for melting and repairs, and to do away with large primary outlay.

The ordinary-built furnaces are cheap enough in themselves, but if to the cost of the furnaces and pit is added the cost of chimneys, then the sum total becomes a large one, and compared with the cost of one or more Morgan tilting furnaces to provide the same output of molten metal, probably there will be but a slight difference.

If the value of the tilting furnace as a salable asset be taken at any time the balance will be in its favor. A brick chimney has little value if pulled down, but a mechanical furnace always has a value according to its state of preservation.

Whatever furnace is used, care should be taken that it is efficient and as economical in working as the type selected will allow, while the very greatest care must be taken that the accessories required for the proper working of the furnace shall be as efficient as the furnace itself.

Proper lifting apparatus should be provided where the crucibles have to be lifted from the furnace, and this may be simply a block tackle running on an I beam, or some more complicated arrangement as the case may warrant; but in any case a straight vertical lift from the furnace should be made to avoid damage to the crucibles. The economical use of labor is as important as is the economical use of fuel; the question of expenditure in any foundry being of importance.

Fuel.

Besides the furnace and its accessories the fuel used is of considerable importance; a clean, hard coke being more effective than a dirty soft one. Besides the texture of the fuel, its ash content and the question of sulphur has to be considered, for a coke high in sulphur is injurious to the crucibles, and causes their rapid reduction to a useless state.

Gas coke is an expensive fuel for crucible work owing to its unequal composition, structure, and usually high sulphur content, and if the work actually done with this fuel were compared with what is done with an equal weight of hard furnace coke, it would drop out of use quickly, although the price per ton be comparatively low.—Mech. World.

MISCELLANEOUS ALLOYS

By Crucible.

The product of a brass foundry excels in variety of composition that of its iron or steel substitute, due perhaps to an ornamental as well as a practical use being made of it.

Gun metal

Where toughness and durability are wanted as for bearings and general castings, no better alloy than gun-metal is available. The proportion and constituent parts when required to be hard and tough, are copper 88, tin 10, zinc 2, giving a tensile strength of from 28,000 to 30,000 pounds per sq. inch.

For a softer and less strong metal, 2 parts less of copper and 2 additional of lead are used.

Sound castings with small shrinkage and not subject to corrosion are other prominent features.

Size and rate of cooling of casting, skill in properly mixing the various metals, ventilating the molds and relieving the cores, all conspire to affect the ultimate strength. Large castings have usually less strength than small ones, due to the fact that they almost of necessity must cool slower.

Phosphor Bronze

Phosphor bronze is composed of copper and tin with about ½ per cent. of phosphorus.

It is harder than ordinary gun-metal, very close grained and of about 35,000 pounds per sq. inch tensile strength. When heated, it is liable to crack. Much care should be exercised in melting and pouring it, and repeated melting depreciates its virtue.

Manganese Bronze

Manganese bronze is in composition similar to the two grades of gun-metal already referred to except that a small proportion of ferro-manganese is added.

It is largely used for propeller blades and is rolled into rods for various mechanical and commercial services.

Propeller blades as ordinary cast, have with it an ultimate tensile strength of about 49,000 pounds per sq. inch. If cast on end, however, and with a head of 2 feet or more, slightly better results will be obtained.

The strength of the rolled rods varies from 63,000 eo 72,000 pounds per square inch ultimate tensile strength.

Moffitt & Irving have applied for 3 1-5 acres of Ashbridge's Bay, Toronto, to erect a steel foundry and smelter.

R. J. Cluff, general manager of Steel and Radiation, Ltd., is preparing to erect the first building of their new plant in St. Catharines. This building will be 120x240 ft. and will cost $100,000

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

GALT, ONT.—The Canadian Tap & Die Co. intend adding considerable new equipment to their plant in the near future.

MONTREAL, QUE.—F. Driscoll has succeeded in interesting a number of Montreal capitalists in the Herbst Full Light Moving Picture machines and a company has been formed with a capital of $100,000 to manufacture and sell the machines which permit of motion pictures being shown without the extinguishing of the lights in a theatre.

LONDON, ONT.—The C.P.R. will spend $500,000 on a new 22-stall round house, new station yards and car shops in this city.

CARGILL, ONT.—Mr. McGillivray, of Brockville, is promoting a company which is establishing a windmill and iron pump factory here.

LONDON, ONT.—A large American steel industry with a capital of from $20,000,000 to $30,000,000, may establish a branch in London.

PORT BURWELL, ONT.—The C.P.R. propose spending $30,000 here on a round house, elevator, etc.

GUELPH, ONT.—Cowan & Walker have been awarded the contract for the new factory of the Canada Gate Co., a branch of the Iowa Gate Co., of Cedar Falls, Iowa.

CAMPBELLTON, N.B.—The machinery for the equipment of the new I.C.R. repair shop is now fully installed and many machinists and repair men have been recalled from other shops along the line.

PORT ARTHUR, ONT.—It has been announced here that the Greig Co. will commence work on their new plant as soon as possible.

TORONTO, ONT.—The C.P.R. has placed orders for about $3,500,000 worth of steel rails. The greater part of this order went to the Lake Superior Corporation, and the balance to the Dominion Iron and Steel Co. In addition to this, the railroad company is still in the market for about 20,000 tons of rails, which will bring its orders for the present year considerably over those for 1910. The C.N.R. has already placed orders for 90,000 tons, and before its construction programme is filled for the year, this amount will be more than doubled.

MEDICINE HAT, ALTA.—Following the announcement that the Lucky Jim smelting works would locate here, comes the news that this city will also get a wire nail factory, a glass works, an artificial stone and marble industry and a foundry and machine shop. Sites have already been selected for the Alberta linseed oil mill and the Alberta iron roller mills.

HAMILTON, ONT.—As a sequel to the numerous reports published that the plans of the Oliver Chilled Plow Co. depended to a certain extent upon the present reciprocity negotiations, the president, J. D. Oliver, has issued a flat denial of the same and expresses his regret that the company's name should be dragged into politics.

SYDNEY, C.B.—The new ammonia plant at the steel works is partly completed and the whole will be in operation in about a month. The best which the old plant has been able to do is thirteen tons. Twenty-seven tons will be possible with only half of the new plant in operation. Only one generator will be at work each day.

VANCOUVER, B.C.—The big plant of the Quesnelle Hydraulic Gold Mining Co., on Twenty Mile Creek, Cariboo District, which will sift the bed of the Cariboo River will be completed and go into commission next August. It cost upwards of $1,000,000.

NORTH VANCOUVER, B.C.—The Department of Public Works, Canada, has awarded McDougall-Jenkins, Engineers, of North Vancouver, a contract to build a steel tug for use in Victoria Harbor. The type of engine will be inverted fore and aft compound surface condensing, with a high pressure cylinder 15 inches and low pressure cylinder 34 inches diameter, stroke 24 inches, back columns of cast iron, front columns of solid round steel, to be equipped with steam reversing gear. Engines to be built by Ross and Duncan, Glasgow. The boiler is to be of the Scotch Marine type, single ended, 12 feet internal diameter at largest course by 11 feet long inside. Working pressure 150 pounds per square inch. There are to be three Morrison corrugated furnaces 36 inches mean diameter. Total cost will be $45,000.

PORT ARTHUR, ONT.—When the Imperial Construction Co. finish work on the new C.N.R. hotel they will commence the erection of the plant for the enamel works at Bare Point. It is also stated that they have the contract for the Port Arthur Wagon Works.

SARNIA, ONT.—The Imperial Oil Co. are building a new boiler shop, engine room and blacksmith shop here. Additional improvements will also be made during the year.

WELLAND, ONT.—The Electro Metals Co. are preparing to double the capacity of their plant here.

HAMILTON, ONT.—The Oliver Chilled Plow Works, have awarded the contract for the erection of its assembling building, amounting to $200,000 for the bulk contract, to H. C. Christman & Co., South Bend, Ind. The Hamilton Bridge Works Co. has the contract for the structural steel required. They will soon ask bids for the erection of a large malleable and gray iron foundry here.

HALIFAX, N.S.—The Scotia Foundry Co., a new concern, have purchased from Ald. Hoben, his store, factory and foundry, and are remodeling the premises. F. H. Stuart, for many years asociated with Ald. Hoben, is the promoter and secretary of the new company.

PRINCE ALBERT, SASK.—A large number of prominent citizens were present at the Prince Albert Foundry recently, when the first castings were turned out from that iron manufactory. Some months ago the city council entered into an agreement with W. McDonald to purchase castings made by him if he would establish a foundry here. This Mr. McDonald has done, and in partnership with him is Mr. Fraser. The foundry is now a going concern and is already receiving a liberal patronage.

NEW YORK.—The Pennsylvania Steel Co. has booked orders for 200 tons of rails for the Canadian Pacific Railway, which is also in the market for three small bridge spans.

MEDICINE HAT, ALTA.—The C.P.R. has been instrumental in securing the removal of the plant of the Lucky Jim Smelting Co. from Nelson to this city. Conditions here are much more favorable than in Nelson.

HANLEY, SASK.—The Hanley Iron Works are now under the control of Lee Bros. and were opened early last month. A full line of gasoline engines will be carried, including stationary, portable and tractors, and also a line of automobiles.

TORONTO, ONT.—The Canadian Northern Railway has so far this year, placed orders for 90,000 tons of steel rails for delivery this year. These will cost about $3,000,000. A great proportion of the rails came from Sydney, C.B. These will be laid in Ontario and the Prairie Provinces.

PORT MANN, B.C.—The C.N.R. and the British Columbia Steel Corporation are arranging the details for the latter's big steel plant to be erected here. Water power will be generated on a large scale and a great deal of the smelting will be carried on by electricity. The corporation has secured coal and iron deposits within a radius of 30 to 60 miles of the plant. The plans and estimates of the United Engineering and Foundry Co., Pittsburg, Pa., have been adopted for the proposed plant.

HESPELER, ONT.—The Hall-Zryd Foundry Co., of Grimsby, will locate here and carry on the manufacture of stoves.

MONTREAL, QUE.—The C.P.R. has ordered two huge steam shovels from the Montreal Locomotive Works, and are in the market for steel for three small bridges which are being built this year in connection with the improvements going on all over the company's lines.

HALIFAX, N.S.—The city has approved of legislation in regard to concessions to the Nova Scotia Car Works and to Moirs, Ltd. The Nova Scotia Car Co., successors to the Silliker Car Co. get 20 years exemption from taxation, the loan made to the Silliker Co., five million gallons of water free annually, and the rest at the rate of 7½ cents per thousand gallons, and less if the extra amount used is great enough to qualify for the lower rates. Moirs, Limited, get 20 years exemption of their entire equipment over and above $6,500. It is said to be the intention of this company greatly to increase its plant.

PORTAGE LA PRAIRIE, MAN.—The Canadian Corrugated Pipe Co. will this year make improvements to their factory and instal machinery which will increase the output more than four-fold.

VANCOUVER, B.C.—The C.P.R. has awarded a contract to Digby & Grenier, contractors, of Fernie, for the construction of a large bridge over the Old Man River at the south fork, near Fernie. The bridge will be 860 feet in length and 137 feet high, and will require 1,500,000 feet of timber, 1,000 yards of concrete, 500 piles and 2,000 yards of excavation. It is stated that its construction will occupy the greater part of six months.



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never wear out. They are provided with bushings that can easily be replaced if necessary, and Ring Oilers keep the bearings constantly flooded in oil, thereby preventing the shafts from getting hot and cutting. The Bull Gear bearing has a chain oiler, and a number of other features (which we cannot explain here) make STEPTOE SHARPERS "just a little better."

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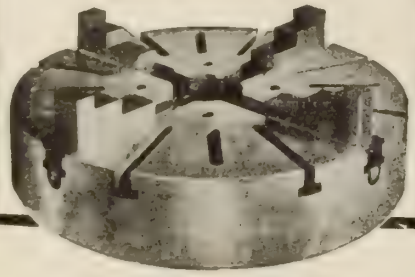
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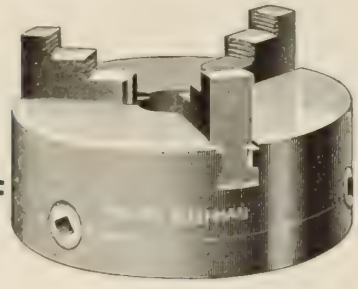
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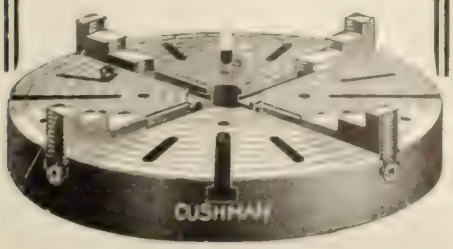


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Hartford, Conn., U.S.A.
Established 1862



KINGSTON, ONT.—The K. & P. Ry. are planning extensive improvements this year. They will repair and renew about thirty-five small bridges and culverts and put in six or seven thirty-inch and thirty-six-inch concrete pipe culverts, erect three small steel girders, and two six-foot concrete arch culverts and four rail top concrete culverts. The company will also install a pillar crane for handling coal at Renfrew.

VANCOUVER, B.C.—The C.P.R. are calling for tenders for the construction of a new ten-stall addition to the engine house in the False Creek Yards.

BURNABY, B.C.—The Sumner Iron Works Co. are about to start the construction of their new works here. They will manufacture machinery, especially saw mill and shingle mill plants.

CALGARY, ALTA.—The new freight yards and round house of the C.P.R. have been put in operation. The round house is a modern structure, and will accommodate a very large number of engines.

ST. PHILOMENE DE FORTIERVILLE, QUE.—The business of B. Adelard, manufacturer of threshing machines, was badly damaged by fire recently.

OTTAWA, ONT.—Latham and Groves, machinists, have been succeeded by Latham & Co.

EXETER, ONT.—The Connor Machine Co. have obtained a charter.

WINNIPEG, MAN.—The Dominion Bridge Co., of Montreal, have made several large additions to their works here. The capacity is now placed at 18,000 tons per annum. An up-to-date engineering and draughting office has also been established.

MEDICINE HAT, ALTA.—The C.P.R. will spend $430,400 for improvements in Medicine Hat this year. The itemized table is as follows:—Extending station, $29,000; double tracked steel bridge, $314,000; extending switching yards, $60,000; new boilers in machine shops, $11,400; new station at Redcliff, $5,000; trackage west of city, $5,000; and gas connection and light for Dunmore yard and fencing of terminal, $6,000.

PORT HOPE, ONT.—The International Tool Steel Co. have let the contract for their new factory to McGreggor & McIntyre, of Toronto, to be completed by May 1st. There will be three buildings, one 160 x 60, another 62 x 30 and a third 30 x 30, all of structural steel.

WELLAND, ONT.—Work on the addition to the plant of the Page-Hersey Tube Mills has been commenced. The increased factory will employ between two and three hundred additional men.

TORONTO, ONT.—The Ontario Brass Rolling Mills has changed its name to Brown's Copper and Brass Rolling Mills.

WOODSTOCK, ONT.—The Linderman Machine Co. have orders enough on hand to keep the factory going full speed for weeks, and these orders have been sent in voluntarily, without any soliciting.

WOODSTOCK, ONT. The Maximilian Tool Co. have their hammers on the market.

WINNIPEG, MAN.—G. Gale & Sons, manufacturers of iron and brass bedsteads, have purchased a site and will erect a $50,000 factory here.

MONTREAL, QUE.—Fire did $150,000 damage to the iron bed and stove foundry of the H. R. Ives Co., here, recently.

TORONTO, ONT.—Moffatt & Irving, a steel and iron firm, are trying to secure a five-acre site for a big steel and iron foundry in the Ashbridge's Bay district.

FALSE CREEK, B.C.—The C.P.R. are calling for tenders for the construction of a new ten-stall addition to the engine house. Construction will commence soon and it is the intention to have the building completed early in July. Ten old stalls are to be demolished to make way for the new addition.

CALGARY, ALTA.—Ten carloads of steel rails have arrived for the new street railway extensions. The rails are the first consignment from the Lorraine Steel Co., of Lorraine, Ohio.

PORTAGE LA PRAIRIE, MAN.—The C.P.R. are considering the building of a water softening plant here this year. The company has built a number of similar plants at points along the line.

PERTH, ONT.—An American syndicate has secured control of the car wheel works here. It is stated that the new owners can secure a contract of 200 wheels per day for five years. It is possible that the plant will be kept here, although Sydney or the Soo are also under consideration.

TORONTO, ONT.—It is reported that MacKenzie and Mann have purchased the patent rights for an invention that fastens steel

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Cleveland, Ohio.

rails to steel ties. If this is true, these gentlemen evidently contemplate a complete change in their railway tie material.

THORNBURY, ONT.—The Reduction plant here will be enlarged and additional ovens put in.

Electrical News.

PORT ARTHUR, ONT.—The Ontario Hydro-Electric Commission will duplicate its plant at the hydro-electric station here to avoid any possibility of a general tie-up through want of extra apparatus. $11,200 will be spent for new equipment.

MAGOG, QUE.—Tenders will shortly be called for the construction of a large power dam on the river here. $125,000 will be expended on the dam and power plant.

SAULT STE. MARIE, ONT.—The Lake Superior Paper Co. will construct another power canal and a plant with a capacity of 40,000 h.p.

VANCOUVER, B. C.—The Vancouver Gas Co., subsidiary to the B. C. Electric Railway Co., will expend this year on plant, etc., about $600,000.

WINNIPEG, MAN.—Vickers, Sons & Maxim of Sheffield, Eng., to whom the contract for the electrical machinery of the new power plant at Point du Bois was awarded, are engaged in installing it. J. F. T. Thomas, of Sheffield, is in charge.

FORT WILLIAM, ONT.—The power plant of the Kaministiquia Power Co. will be increased to nearly double its present capacity.

PORT HOPE, ONT.—T. Garnett has accepted the contract to build the sub-station for the Seymour Electric Light & Power Co. The building will be 41x33, constructed of concrete, brick and steel, and will be finished May 15th.

CALGARY, ALTA.—The electric light by-law calling for an expenditure of $38,000 was carried by a large majority.

CALGARY, ALTA.—The power situation here has been cleared by the installation of a 900 horse-power machine at the Victoria Park power house, and additional machinery capable of producing 6,000 horse-power, including the Kananaskis hydro power. If the by-law for building the power extensions goes through this spring, an immediate start will be made with the building of the receiving and distributing stations for the hydro-electric power from Kananaskis.

ALBERNI, B.C.—The Alberni District Electric Light and Power Co. have been incorporated and in about a month's time will install fixtures and supply electric light in every home here. Arrangements have been made for the purchase of a steam engine and boiler, and the electricity will thus be generated until such time as the demand for light and power becomes large enough to justify the harnessing of water power.

SASKATOON, SASK.—The city commissioners have prepared the plans and specifications for the new electrical plant to be installed at the power house here this year. The cost is estimated at $60,000.

Municipal Notes.

TORONTO, ONT.—Tenders for the necessary plant for the construction of the new civic car lines are being called by the Board of Control. It will be modern and cost about $95,000. After the construction of the car lines, which will be about three years, the plant will be worth about $38,575, making the net cost $56,798. Tenders have already been called for the rails.

KERRISDALE, B.C.—The contracts for the laying of the pipes for the waterworks system in Point Grey have been awarded. The total amount of the tenders was in the neighborhood of $145,000.

CALGARY, ALTA.—The following expenditures have been authorized by the electorate: waterworks, $245,000; conduit, $60,000; paving plant, $20,000; incinerators, $120,000; fire hall, $75,000; sewers, $40,000, and electric light, $380,000.

BATTLEFORD, SASK.—A waterworks system is being installed here at an estimated cost of $100,000.

CRANBROOK, B.C.—The by-law calling for an expenditure of $100,000 for sewage purposes was defeated.

MEDICINE HAT, ALTA.—The city will spend $52,000 on sewers this year.

OTTAWA, ONT.—The city has been granted power to spend $400,000, of which $300,000 is for new sewage works, without submitting by-laws to the people.

ROSTHERN, SASK.—The municipality is securing estimates with a view to installing a waterworks and sewage system here.

SCOTSTOWN, QUE.—The municipality is considering the installation of a water and sewage system to cost $40,000.

VANCOUVER, B.C.—About $300,000 will be expended for sewer purposes and drainage.

NEW WESTMINSTER, B.C.—The Burnaby ratepayers are being asked to vote $300,000 on a waterworks system.

EDMONTON, ALTA.—A proposition to turn over to the city at the end of three years an equipment complete, capable of delivering at the corporation line, 20,000 horsepower of electrical energy from Rocky Rapids, on the Saskatchewan River, 60 miles from Edmonton, for the sum of three million dollars was made by the Edmonton Heat and Power Co.

LETHBRIDGE, ALTA.—The city will spend over half a million on local improvements this year. This includes appropriations as follows: sewer main extensions, $72,000; water mains, $100,000; storm sewer system, $41,000; and sewage disposal, $70,000.

TORONTO, ONT.—The city has awarded the contract for 27 rubber sleeves for the city's dredges to the Canadian Consolidated Rubber Co., their prices being $32.50, $25, $12.25 and $33 respectively, for 20-inch cast-iron pipe to the Canada Foundry Co., whose price was $39.95 per length.

CALGARY, ALTA.—The work of extending the new high pressure pipe line is now in progress. The cost is placed at $75,000.

FORT WILLIAM, ONT.—The city council has recommended the extension of the waterworks to certain localities at a cost of $750. They are also considering a proposition to install drinking fountains in this city.

HAMILTON, ONT.—This city has secured the necessary legislation enabling it to lay pipes for the purpose of distributing natural gas and selling it to the citizens. Wells, however, must only be bored within the city limits. As power to expropriate the Ontario Pipe Line plant was refused, the citizens will be asked to vote on the proposal to establish the civic natural gas plant.

HAMILTON, ONT.—The city has awarded the contract for the five new boilers at the Beach pumping plant to the Goldie-McCulloch Co., of Galt. This is only one of the large contracts to be filled by the big works.

NORTH TORONTO, ONT.—The ratepayers have authorized an expenditure of $265,000 to construct a sewerage system and to install disposal plants.

MOOSEJAW, SASK.—The city will spend, this year, $175,000 for sewer and water extensions and $50,000 for an incinerator.

MONCTON, N.B.—City Engineer Edington has estimated the cost of the proposed waterworks system at $250,000.

WELLAND, ONT.—Tenders are being called for the construction, etc., of one unit water-driven waterworks pumps, etc.

New Companies.

MONTERELLO, QUE.—The Owens Lumber Co. have been incorporated to acquire and operate saw mills, planing mills, etc., etc.

MONTREAL, QUE.—The Montreal General Contracting Co., capitalized at $200,000, have been incorporated. They will manufacture and deal in tools, implements, machinery, and erect iron foundries, machine shops, etc. E. G. Evans, civil engineer; R. Moffat, contractor; G. G. Hyde and W. G. Pugsley, advocate; and R. C. Grant, accountant; all of this place.

MONTREAL, QUE.—The E. Cantelo White & Co., have been incorporated to manufacture and deal in electrical fittings, appliances, etc. F. C. Reynolds, manager, Westmount, M. Alexander, advocate, D. Burley-Smith, clerk, R. Lloyd-Jones, manager, and T. H. Warren, bookkeeper, all of Montreal. Capital, $50,000.

MONTREAL, QUE.—The Eureka Damper Co. have been incorporated to manufacture and deal in stoves, furnaces, engines, boilers, etc. A. W. G. Macalister and C. M. Cotton, advocates, R. E. Allan, secretary, J. M. Mortle, student, and J. W. H. G. Hopman van den Berg, diamond merchant, all of Montreal. Capital, $60,000.

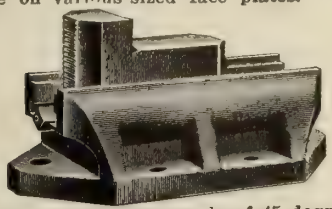
TORONTO, ONT.—The Fisher Electric Mfg. Co. has been incorporated and will manufacture and deal in electrical apparatus, supplies, etc., and carry on business of iron-founders, brass-founders, tool-makers, etc. F. C. L. Jones, barrister, L. W. Nurse, accountant, F. H. White, student-at-law, A. J. Peirce, law clerk, and E. M. Brown, stenographer, all of Toronto. Capital $250,000.

OTTAWA, ONT.—Morisset & Morisset have been incorporated and will manufacture and deal in machinery, implements, etc. L. C. Morisset, L. H. Morisset and M. A. Morisset, financial agents, A. R. Morisset and G. O. Morisset, civil servants, all of Ottawa. Capital, $100,000.

TORONTO, ONT.—The British Columbia Steel Corporation have been incorporated to manufacture and deal in iron and steel. W. Gilchrist, solicitor's clerk, A. M. Garden, W.

Face Plate Jaws

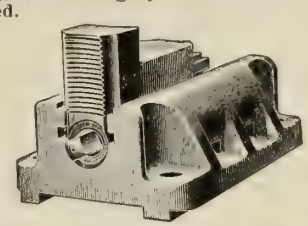
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Ends pointed at an angle of 45 degrees so that four jaws will fit close together at centre. Sizes 4-in. to 14-in.

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C. Davidson, and W. Lawr, students-at-law, and C. Y. Spearing, secretary, all of Toronto. Capital,, $10,000,000.

MONTREAL, QUE.—The Laurentide Co., capital $10,000,000, have been incorporated to erect, operate, etc., etc., pulp mills, factories, etc. R. C. McMichael, W. F. Chipman, and R. O. McMurty, advocates; F. G. Bush, bookkeeper, G. R. Brennan, stenographer, M. J. O'Brien and H. W. Jackson, clerks, all of this city.

TORONTO, ONT.—The Skeena-Naas Pulp and Lumber Co., capital $1,500,000, have been incorporated to own and operate saw mills, pulp mills, etc. W. Gamble, of Ottawa, barrister, H. B. Housser, financial agent, A. B. Taylor and S. R. Broadfoot, students, and L. Hull, clerk, all of this city.

MONTREAL, QUE.—The Standard Steel Works, capitalized at $1,000,000, have been incorporated to carry on the business of iron masters, steel makers, steel converters, iron founders, etc. G. V. Cousins and O. B. McCallum, barristers; P. F. Brown, secretary, W. R. Ford, clerk, and S. T. Mains, bookkeeper, all of this city.

OTTAWA, ONT.—The Power Specialties, Limited, capital $50,000, have been incorporated to carry on a general foundry and machinery business and to manufacture and deal in furnaces, boilers, stoves, ranges, etc. J. K. Paisley, hotel proprietor, F. W. Bendon, agent, G. H. Bendon, manufacturer's agent, G. W. Sequin, city collector, and L. Blackmore, agent, all of this city.

Planing and Saw Mills.

VANCOUVER, B.C.—The B. C. Lumber Co., a $20,000,000 concern, will erect a saw and pulp mill on their Massett Island property, and contemplate the erection of two large mill plants on the southern mainland.

CORDOVA, ONT.—Ryan & Lynch's sawmill was totally destroyed by fire. The loss will amount to about $1,300.

RODNEY, ONT.—The sawmill and lumber yard of Wm. Flater & Co. were completely destroyed by fire recently.

MASSETT, B.C.—It has been announced here that L. C. Christie, of Ladysmith, is interested in a proposition to construct pulp mills on the Ain river, Graham Island, and open up sawmills in the vicinity.

PRINCETON, B.C.—McDougall & Waddell have completed arrangements to operate a sawmill on Onemile. It is understood the B. C. Cement Co. will require half a million to use in construction work.

VERNON, B.C.—W. H. Magee, of Vernon, who has been operating a sawmill at Lumby for a number of years, has made arrangements to operate the Ruth & Turner mill at Canoe Creek, during the summer.

GALT, ONT.—Plested & Parker have about completed their new planing mill here and will make sashes, doors, etc.

FORT GEORGE, B.C.—The Peace River Lumber Co., an American syndicate, will erect a sawmill here.

ABBOTSFORD, B.C.—The Abbotsford Timber & Trading Co. are opening up a lumber yard and mill here. They will also erect a large warehouse and office building.

REVELSTOKE, B.C.—The Deamond Mills Co., of this place, will erect a sawmill near Arrowhead.

WINNIPEG, MAN.—A Winnipeg syndicate, headed by J. D. McArthur, railway contractor, has acquired the assets of the Fort George Lumber & Navigation Co., which recently went into liquidation. The holdings include two sawmills at South Fort George.

HESPELER, ONT.—W. A. Kribs is enlarging his planing mill, sash and door factory here, and installing additional machinery.

NELSON, B.C.—Waters & Pascoe have opened up their new $10,000 sash and door factory here.

MOOSE JAW, SASK.—The Western Manufacturing Co., Regina, has purchased the Saskatchewan Sash & Door Co. here and has spent $10,000 improving it. Included in the improvements was the addition of modern machinery for the manufacture of sash, doors, mouldings, frames and turned work, store and office fixtures.

Building Notes.

VANCOUVER, B.C.—The Vancouver Hotel will build an annex, at a cost of $190,000.

PRINCE ALBERT, SASK.—A, Lunn, of Asquith, Sask., will build a large hotel here, at a cost of $100,000.

SASKATOON, SASK.—Storey & Van Egmond, of this city, have prepared plans for a six-storey departmental store building here.

NEW WESTMINSTER, B.C.—The Westminster Trust Co. will erect a ten-storey building here. Only six storeys will be erected at present.

CALGARY, ALTA.—Plans have been prepared for a six-storey block for F. Fairey. The cost will be about $300,000, and it will contain stores, offices and apartments.

SASKATOON, SASK.—J. I. Case Co., the big threshing machine manufacturers, of Racine, Wis., have secured a site upon which to erect one of the largest warehouses in the city.

MONTREAL, QUE.—E. H. Ford, Canadian manager of the Ford Iron Co., and representing an English syndicate, has announced that they will spend $1,250,000 in building summer hotels at Montreal, Toronto, Winnipeg, Ottawa and Vancouver.

VANCOUVER, B.C.—Architect Hooper prepared the plans for a four-storey labor temple, to cost $143,000. The building, planned to be 75x120 feet, will have reinforced concrete and brick curtain walls. The Norton-Griffiths Steel Construction Co. have the contract.

TORONTO, ONT.—It has been estimated that an additional $300,000 will be spent on St. Alban's Cathedral here this year.

SASKATOON, SASK.—The city is procuring plans for a new city hall, to cost $150,000.

CALGARY, ALTA.—The Hudson's Bay Co. are building a big six-storey departmental store here, at a cost of $100,000

VANCOUVER, B.C.—F. Patrick, son of the millionaire lumberman, is promoting the erection of artificial ice rinks in the two coast cities. $200,000 will be expended in the buildings and plant here.

NEW WESTMINSTER, B.C.—The new Royal Columbian hospital will be built here this spring, at a cost of $175,000. Radical changes in the plans will probably necessitate the calling of new tenders.

SAULT STE. MARIE, ONT.—It is generally understood that the newly-incorporated Lake Superior Paper Co., capitalized at $8,000,000, will build a large paper plant here. They have purchased twenty acres from the Lake Superior Power Co. The land includes the buildings on it, which consist of the frame rear extension of the pulp mill, the sulphite mill, and the smelting and reduction works. The buildings are incorporated in the new works and will be used.

VANCOUVER, B.C.—The B.C.E.R. will erect a $350,000 building here. It will be strictly modern.

WEYBURN, SASK.—The M. D. McKinnon Co., intend erecting a large departmental block of brick structure with elevator and all modern conveniences.

HARRIS, SASK.—The Imperial Oil Co. will erect a warehouse and two large tanks at this point as soon as spring opens up. Wilson & Conway will be in charge.

ST. JOHN, N.B.—The contract for the construction of the foundation of the Atlantic Sugar Refinery Co.'s two million dollar plant at the ballast wharf has been awarded to The Foundation Co., Montreal.

VICTORIA, B.C.—H. S. Griffith, architect, has prepared plans calling for a mammoth structure ten storeys high to cost $1,000,000. It is planned to serve the purposes of a theatre, hotel, and office building.

FORT FRANCES, Ont.—The C.N.R. propose spending $200,000 on a summer hotel and grounds at Pither's Point, here.

General Manufacturing.

PERTH, ONT.—W. J. Winn has been engaged lately in installing the gas producer plant and a number of machines at his factory here.

ST. JOHN, N.B.—The Wilson Box Co. have successfully started operations at Fairville. The plant and lumber yards cover eight acres, while the box mill itself has 42,000 sq. ft. of floor space. The power plant is built of concrete and covered by re-inforced concrete roof, and contains two new tubular boilers of 125 h.p. each and a Corliss engine capable of developing 250 h.p., making a most complete steaming outfit; the fuel used being the sawdust and shavings from the different machines, which are all connected to a blower system, which conveys it direct to the boiler house.

MONTREAL, QUE.—Brunelle Co., manufacturers of washing machines, has been registered. H. Brunelle and A. Brunelle.

SYDNEY, C.B.—Alex. Cross & Sons, Glasgow, Scotland, will shortly erect here a big fertilizer plant. They have contracted with the Steel Company for the company's total output of basic open hearth slag, from which the fertilizer is to be manufactured.

EDMONTON, ALTA.—P. Burns, the meat packer, will build his big packing plant in Edmonton, instead of Strathcona. The plant will be large, with modern equipment.

WOODSTOCK, ONT.—A deal has practically been consummated looking towards the establishment in this city of a branch of the big packing firm of Libby, McNeill & Libby, of Chicago.

WEST TORONTO, ONT.—Gunns Ltd. are erecting a refinery here for cotton seed oil, the first of its kind in Canada.

NEW WESTMINSTER, B.C.—Fox Bros., of Nelson, will establish a big jam factory here.

WOODSTOCK, ONT.—The Woodstock Textile Co. have started manufacturing their goods.

KINGSTON, ONT.—It has been decided to remove the Richardson Mica-washer Works to Trenton, N.J.

CALGARY, ALTA.—The Western Agencies & Development Co. are promoting the establishment of a linseed oil factory here.

LINDSAY, ONT.—The Canadian Handle & Wood Turnings Co. have taken over the business of the Rider & Kitchener Co. and will commence operations about the middle of this month.

SASKATOON, SASK.—Cushing Bros., Ltd., have secured a site and will shortly establish a wood-working plant here. They have plants in Calgary and Edmonton.

ST. JOHN, N.B.—Work has been started on the new $2,000,000 plant of the Atlantic Sugar Refinery.

PETERBORO, ONT.—The Independent Tire Co. will likely locate here. They contemplate the erection of a three-storey factory, with $75,000 worth of machinery.

Trade Notes.

TORONTO, ONT.—The General Supply Co., with headquarters in Ottawa, have opened offices and warehouse at 119 Adelaide St., west, in this city. They will handle a full line of belts, mill supplies, etc.

The Sterling Lubricator Co., of Rochester, N.Y., announce the removal of their factory to Norwich, Conn., where their shops will be combined with those of the Uncas Specialty Co., the new combination to be known as the Sterling Machine Co.

National-Acme in Montreal.

The National-Acme Manufacturing Co., Cleveland, manufacturers of automatic machines and their products, have just completed the equipping of a new plant at St. Elizabeth and G.T.R., St. Henri, Montreal, and operations will be started in April. In the Montreal plant they will manufacture screws, nuts, bolts and special parts for automobiles, electrical apparatus and all parts that can be made from bar stock. The equipment consists of Acme Automatic Multiple Spindle Screw Machines. Stocks will be carried of cap and set screws, plain and castellated milled steel nuts, semi-finished nuts and milled brass nuts. Contracts will also be made for the manufacture of special screws, nuts, etc.

Dominion Steel Corporation Extensions.

During 1911, the Dominion Steel Corporation, Amherst, N.S., will carry forward a vast amount of new work in connection with extensions to the plant. Recently the company placed plans in the hands of the local contractors and asked for tenders for the construction of some eight buildings. These new structures are to be as follows: Machine shop, 120 x 130 feet; foundry and machine shop, 120 x 440 feet; boiler house, 120 x 160 feet; pattern shop, 60 x 200 feet; car repair and carpenter shop, 120 x 140 feet; warehouse, 60 x 200 feet, 2 storeys; oil house, 60 by 60 feet; round house, 230 feet diameter, about 16 locomotive stalls. All of these buildings will be constructed of steel and compressed brick. The outlay will be in the vicinity of three-quarters of a million dollars. The new general office will be another structure for erection immediately, and plans for this $100,000 edifice are now in course of preparation. This will be a separate and distinct contract from the list already noted. Besides the construction of these buildings, there is also to be undertaken in 1911 the

PATENT NOTICE

NOTICE is hereby given that the owner of Canadian Patent No. 117,439, dated March 23rd, 1909, for Combustion Engines, is prepared to grant licenses under section 44 of the Patent Act, upon a reasonable royalty, to anyone wishing to manufacture the invention covered by the above patent. For licenses and information apply to

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establishment of a merchant bar and rod mill, two blast furnaces, probably about 75 more by-product coke ovens, before next new year: the completion of the new turbo-electric system, and several other new items of expansion may develop during the present year.

Canadian Tap and Die Co., Galt, to Enlarge Plant.

Edward Blake, Jr., of Wells Bros., manufacturers of taps, dies, etc., has now taken over the management of the Canadian Tap & Die Co., Galt. It is his intention to install new machinery and otherwise increase the manufacturing facilities. The Canadian Company will manufacture a full line of screw cutting tools and in addition will handle a line of Wells Bros. machinery and tools, including the Universal Tool and Cutter Grinder. Mr. Blake will also represent the Miller's Falls Co., of Miller's Falls, Mass., manufacturers of braces, chain drills, hand drills, bench drills, breast drills, automatic and ratchet screw drivers, chucks, hack saws, etc. A stock will be carried at the Galt factory.

Bolt Factory for Fort William.

Barnett-McQueen Co. are installing a plant on Christina St., Fort William, for the manufacture of bolts of all kinds. Oil will be used as fuel in the heating furnaces. It is intended to add later machinery for the manufacture of heavy bolts and rivets for construction work. About 20 men will be employed on the start.

Welland Machine and Foundries, Limited.

A meeting of the members of the syndicate who took over the Robertson Machinery Co.'s plant, appointed the following as officers of the concern, which will now be known as "The Welland Machine & Foundries, Limited." Directors: J. H. Crow, R. J. McCormick, D. D. Hooker, D. Ross, Wm. Edestrand. President, David Ross; vice-pres. Wm. Edestrand; sec.-treas. J. H. Crow.

Welland's Industries Expanding.

As previously announced in Canadian Machinery, the Page-Hersey Tube Works will materially enlarge and improve their Welland plant. The enlargement will probably cost about $150,000. The contract for the first work in this connection—the erection of a new business office—has been let to David Dick & Sons, contractors, work to be begun as soon as the weather will permit. This office will be a two-storey, fireproof brick structure, of handsome design, and will cost about $8,000. A galvanizing plant will be included in the additions to the works.

Dick & Sons have secured the contract for the plant of the Canadian Automatic Transportation Co., at $25,000.

It is reported that Canadian Steel Foundries which secured control of the Montreal Steel Co., Montreal and Ontario Iron and Steel Co, Welland, will build a blast furnace in connection with the Welland plant this year at a cost of $1,250,000. Iron ore will be brought to Welland by water and smelted into pig iron and steel. A large tract of limestone property, west of Port Colborne, is under option, and it is believed this is to supply limestone for the smelter. A warehouse and machine shop will be erected at once at a cost of $100,000. The plant of the Electro Metals will be doubled in size. The company have been exceedingly prosperous, and have found it necessary to have increased accommodation.

United Motors, manufacturers of automobiles, will erect a factory building the coming summer.

Quality Beds have let the contract for the construction of a brick addition 60 x 80 ft.

Book Review.

Engineering Index Annual—Published by the Engineering Magazine, 140 Nassau St., New York; size 6x9 ins., 500 pages. Price $2.

This is the fifth annual index devoted to engineering and technical publications in Europe and America. While by no means complete as far as Canadian technical publications are concerned, it is recognized as a very valuable reference book for anyone seeking information on any technical subject.

The articles indexed are first grouped under the general division of engineering practice to which they belong—Civil, Mechanical, Electrical, Mining, etc., and under these again they are sub-grouped according to the recognized special divisions of each field.

A new feature has ben introduced into the fifth index annual to make it easier and more convenient for the consultant to find the reference he seeks. This is the assembly of all catchwords under their classified arrangement in front of the book, so that all topics under any heading, which in the book may be scattered through several pages, are here condensed into a list of a column or less.

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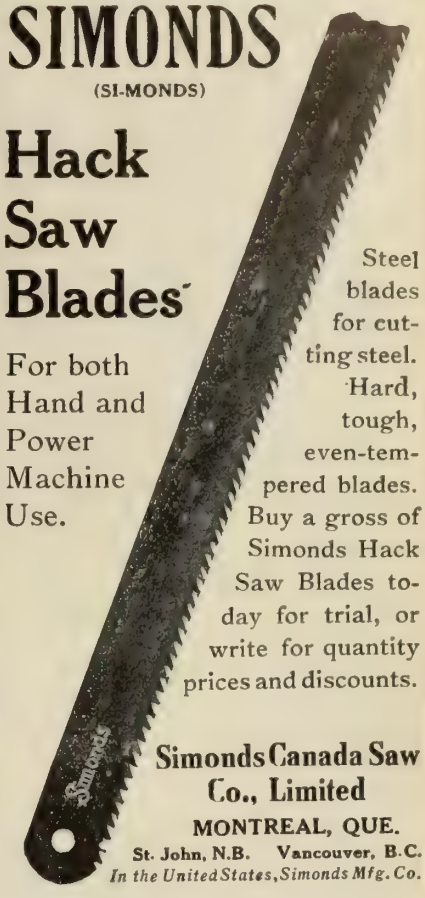
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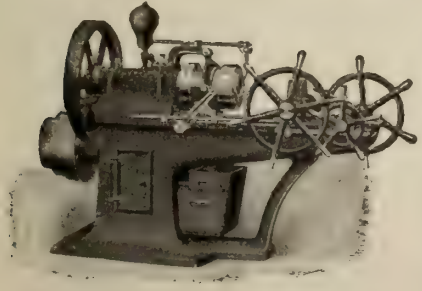
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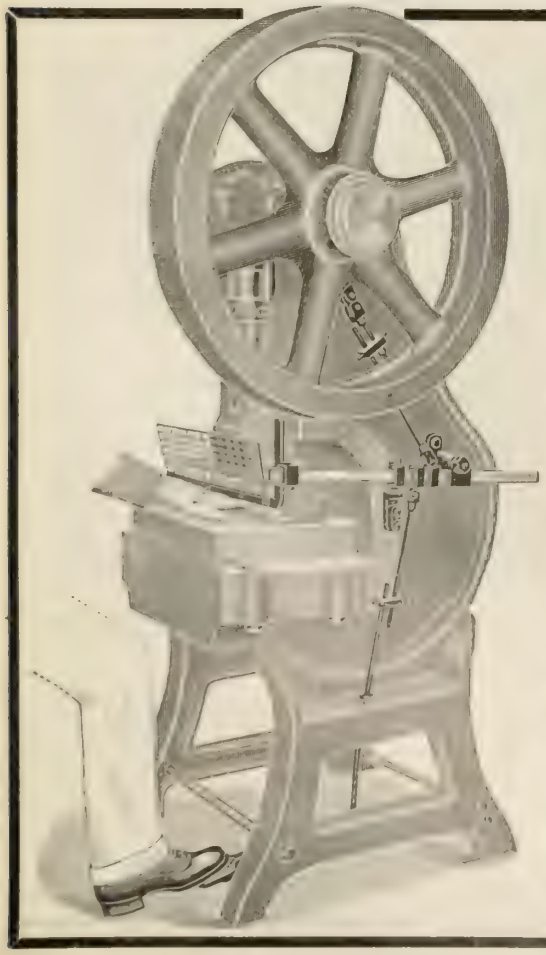


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The Strength of Oxyacetylene Welds in Steel. By Herbert L. Whittemore, has just been issued as Bulletin No. 45 of the Engineering Experiment Station of the University of Illinois. This bulletin gives the results of an extensive series of tests to determine the strength which may be developed in welded joints made by fusing thin steel plates together by means of the flame of an oxyacetylene blowpipe. It was found that with careful manipulation such a welded joint may be expected to have about 85 per cent. of the strength of the plate material. Considerable information as to methods of manipulation of the oxyacetylene blowpipe and the proper regulation of the gases is also given in the bulletin. Copies of Bulletin No. 45 may be obtained gratis upon application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

Oxhydric Welding—32-page catalogue on coated paper, from the American Oxhydric Co., Milwaukee, Wis., describes and illustrates in a very interesting manner their system of cutting and welding. Numerous applications of the system are given, these being illustrated in a number of cases.

An Investigation of Built-up Columns Under Load, by Arthur N. Talbot and Herbert F. Moore, is issued as Bulletin No. 44 of the Engineering Experiment Station of the University of Illinois.

In the course of this investigation, laboratory tests were made on steel and wrought iron built-up columns, such as are used in bridges and other structures, to determine not only their strength, but also the way in which the compressive stresses vary over the cross-section of the channels or other component parts of the column and throughout its length. The amount of stress in lattice bars and its variation from bar to bar was also measured. The distribution of stress over the cross-section of a lattice bar was studied. Field tests were conducted on the columns of a railroad bridge under the load of a locomotive and train, and the distribution of stresses over various parts of the columns was measured. The investigation shows that the variations from the ideal column which result from shop and erection processes may be more important than the influence of length, and that on account of such causes the stress at one or more points in a column may be as much as 50 per cent. inexcess of the average stress. This investigation may be expected to have an important bearing on structural engineering practice. Copies of Bulletin No. 44 may be obtained gratis upon application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

Farwell Automatic Gear Hobber.—Circular 805 from the Adams Co., Dubuque, Iowa, 16 pages, 8½x11 ins., describes and illustrates the Farwell Gear Hobber.

Ajax Electric Riveting Machines—Catalogues are being issued by the Hanna Engineering Works, 2095 Elston Ave., Chicago, who have entered into a contract with the Electric Machinery Sales Co., Milwaukee. The light yoke riveters shown in one of the bulletins is said to be the first offered to the trade. Circular matter will be furnished by the Hanna Engineering Works on application.

Smooth-on—The Smooth-on Mfg. Co., Jersey City, N.J., have issued 16-page booklet describing their products, including cements, "Smooth-on" for castings, joints, packing, gaskets, paint, etc.

Flexible Shaft—Catalogue from the Bamridge Patent Flexible Shaft Co., British Engineering Works, Kettering, Eng., describes the Bamridge patent and illustrates many applications.

Decimal Equivalents—The Garvin Machine Co., Spring and Varick Sts., New York, are mailing on request a large hanger, 24x24 ins., containing decimal equivalents in sixty-fourths. The type is large enough to be seen from considerable distance.

Casehardening—W. H. Palfreyman & Co., 17 Goree-Piazzas, Liverpool, have issued a booklet on "Hints About Casehardening: What to Use, and how to do it." The booklet gives a fund of general information on the subject.

Discount List—S. A. Daniel, Birmingham, Eng., has issued an export discount list of tools.

Quick Threading Attachment—16-page catalogue, 9x12 ins., from the Hendey Machine Co., Torrington, Conn., U.S.A., describes the quick threading attachment for Hendey-Norton lathe.

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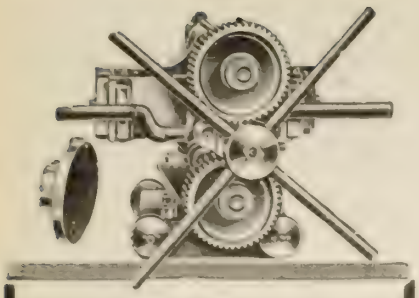
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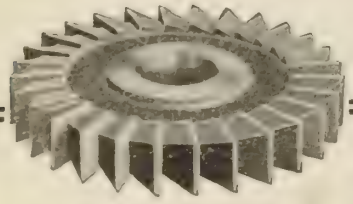
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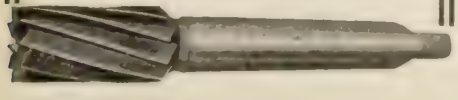
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The Mechanical World Electrical Pocket Book. Size 4 by 6 in.; pages 208. Bound in cloth. Published by Emmott & Co., Ltd., 65 King Street, Manchester, England. Price 12 cents net. The 1911 electrical pocket book has been thoroughly revised and many new illustrations introduced. Among the particular changes noted are that the descriptive matter has been condensed, thus affording space for a larger number of new tables on subjects such as current densities, permissible temperature rise, percentage losses in electrical machinery, units of illumination, incandescent lamp current consumption, life of glow lamps and allowances for depreciation. The notes on accumulators have been rewritten and extended as well as the sections dealing with circuit breakers, boosters and the use of electricity in coal mines. Another change worthy of special mention is the introduction of a new section on liquid starters. In all sections, both the new ones and those which have been included in previous issues, considerable useful data and tabular information have been given.

Drop Forging, Die Sinking and Machine Forming of Steel—By J. V. Woodworth, published by the Norman W. Henley Publishing Co., 132 Nassau St., New York; 340 pages, 6x9 ins., 300 illustrations. Price, $2.50.

This is a practical treatise on modern shop practice, processes, methods, machines, tools and details, treating on the hot and cold machine-forming of steel and iron into finished shapes; together with tools, dies and machinery involved in the manufacture of duplicate forgings and interchangeable hot and cold pressed parts from bar and sheet metal.

This is the fifth dealing with forging, tempering, power presses, etc. This one is full of facts gleaned from various sources, such as the technical papers. The growth of die-sinking and machine forging has necessitated a standard work, which has now been prepared. The methods are described in plain language, which will be easily read and understood by those engaged or interested in this line of work.

CATALOGUES.

AIR COMPRESSORS—Catalogue 391 from National Brake and Electric Co., Milwaukee, U.S., describes National air compressors and accessories.

REFRIGERATION—"A profitable day load," is the name of a refrigeration bulletin No. 508, issued by the Triumph Ice Machine Co., Cincinnati, Ohio. A number of refrigeration outfits are shown.

BELT DRESSING—Cling-Surface Co., 1032 Niagara Street, Buffalo, N.Y. Circulars. Deal with the use of Cling-Surface for keeping leather and cotton belts and rope pliable and waterproof, preventing all drying or cracking and stopping the slipping of the belts.

FEED WATER HEATER—National Pipe Bending Co., 156 River Street, New Haven Conn. Booklet. Treats of the National feed water heater for boilers from 5 to 4,000 h.p., which consists of one or more coils of seamless drawn tubing inclosed in a cast iron or steel shell to which exhaust steam is admitted, heating the water as the latter passes through the tubing. Directions for erecting the heater and its use in condensing steam plants are included.

TRANSMISSION SUPPLIES—The Elmira Machinery & Transmisson Co., Elmira, Ont., have issued Catalogue B, in which a complete list of transmission supplies for engineers, founders and machinists, is listed. Among those manufactured by this company are power transmission appliances, wood split pulleys, friction clutches, couplings, hangers, etc. In addition, there are listed Cumberland turned and ground steel shafting, Chapman double ball bearings, leather, rubber, cotton and balata belting, etc.

WATER VALVES—A 4-page folder describing the hydrostatic water valve and its application, has been issued by the Cleveland Steel Tool Co., 660 East 82nd St., Cleveland, Ohio. The valve maintains automatically constant level in tanks, vats, heaters, low-pressure boilers, etc.

FRICTION CLUTCHES—The Dodge Mfg. Co. have issued a 16-page catalogue describing Dodge split and solid clutches. The economic features are dealt with and the construction of the clutch is given in detail. A two page table shows the sizes manufactured, together with full information in regard to h.p. transmitted, speed, face of pulley, cost, etc.

POLYPHASE INDUCTION MOTOR—Bulletin 126 from the Crocker, Wheeler Co., Ampere, N.J., discusses the induction motor and its application in textile mills, woodworking plants, etc. Many illustrations show these applications.

LAGONDA-ENTERPRISE MULTIPLE STRAINERS is the title of an attractive catalogue recently issued by the Lagonda Mfg. Co., of Springfield, Ohio. It contains a description of a new type of Multiple Strainer suitable for the removal of suspended matter, such as ice, sticks, seaweed, grit, etc., from boiler feed water, and also from condenser circulating water. These strainers are built in sizes up to 48 in., with a number of different compartments, depending upon the size. The Lagonda-Enterprise Strainer is unique in that its effective straining area is from 2½ to 6 times larger than the area of the pipe. It is also possible to clean separate compartments of the strainers without interrupting the flow through the others, thus eliminating the necessity of shutting down circulating or boiler feed pipes in order to clean out the filters used.

RUBBER VALVES.—Folder from H. W. Johns-Manville Co., 100 William street, New York, describes J-M rubber valves.

STEAM SPECIALTIES.—A 40-page catalogue for 1911 from Darling Bros., Montreal, describes and illustrates a number of lines manufactured and handled by them, including heaters, pumps, traps, valves, etc.

VOLUTE PUMP—Bulletin 106 from the John McDougall Caledonian Iron Works, Montreal, describes the Volute Pump and its applications.

PULLEYS.—Folder from Positive Clutch & Pulley Works, 11-13 Jarvis street, Toronto, describes the pulleys and clutches being placed on the market by them.

MECHANICAL LUBRICATOR. — Bulletin 53, 16 pages, 6 x 9 ins., from the Richardson-Phenix Co., Milwaukee, shows a number of installations and gives useful information regarding the operation of the system.

UNIVERSAL ELECTRICAL DIRECTORY By J. A. Berly, published by H. Alabaster, Gatehouse & Co., 4 Ludgate Hill, E.C., London, Eng.; 1,552 pages; price, post free, 14s 6d.; British, Colonial and General Sections only, 10s.

This eleventh edition has been as carefully revised as previous issues, and no pains spared to make it as accurate and reliable as ever.

The contents are divided into four sections: The British, with 13,590 names; Colonial and General, with 5,840 names; Continental, with 7,970 names; U. S. A., with 6,500 names; totalling 33,900 names, although unimportant entries are omitted. Each section is subdivided into alphabetical and classified sections, while in the case of the British a Geographical Section has been added, which is a necessity for all travelers. Any section can at once be referred to by means of a thumb index.

Telegraphic addresses, telephone numbers and codes are given in the alphabetical sections, financial particulars of British limited liability companies, also of foreign companies with a British address.

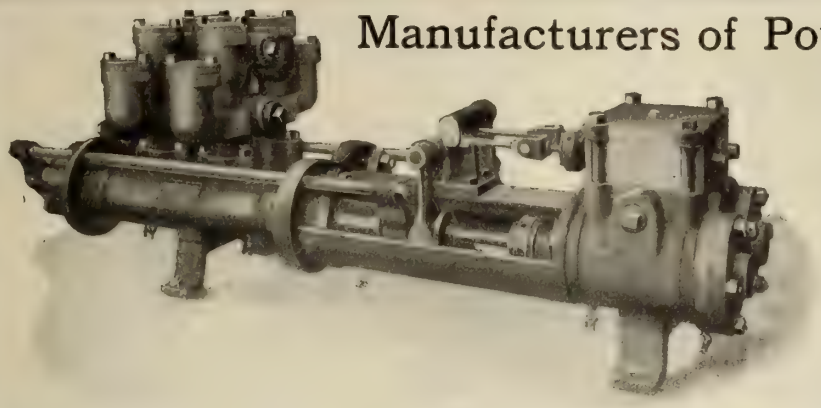
A new feature, which has been asked for, is the separation of the London from the provincial names in the British alphabetical section.

The lists of electricity undertakings in the United Kingdom, British colonies and some other countries include the following details: The nature of the supply, system of distribution, capacity of plant, voltage and chief engineer's name, and in the case of alternating current, the phase and periodicity are included.

A list of specialties appears in the British Section, arranged alphabetically, according to the name of the article, followed by the maker's or agent's name and address. This, judging by enquiries, should supply a present-day want.

"PRACTICAL ENGINEER" POCKET BOOK—Issued by the Technical Publishing Co., 55 and 56 Chancery Lane, London, W.C., England; 800 pages. Price, 40 cents postpaid.

In this new 1911 issue obsolete data has been dropped and several new topics treated. The new matter includes notes on stoker systems, thermal storage, superheaters, roller bearings, etc. Revision has been made of articles dealing with shop gauges, patterns, etc. Over 700 pages are devoted to subjects of interest to the engineer and mechanic, the remaining pages being blank and arranged for diary and notes.



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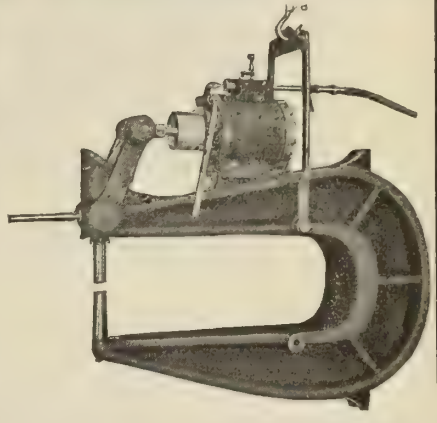
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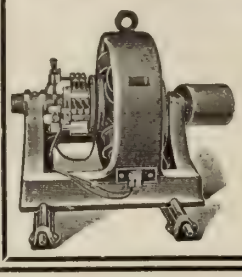
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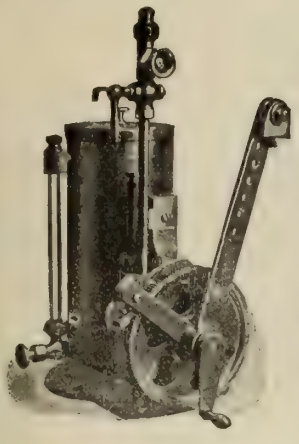
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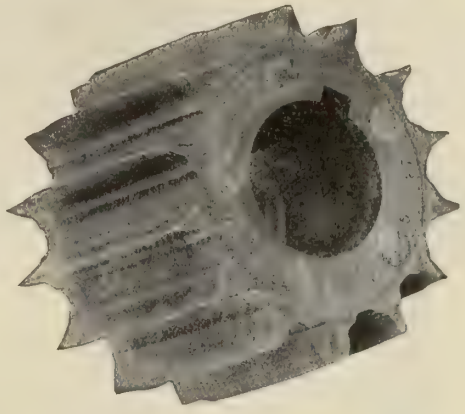
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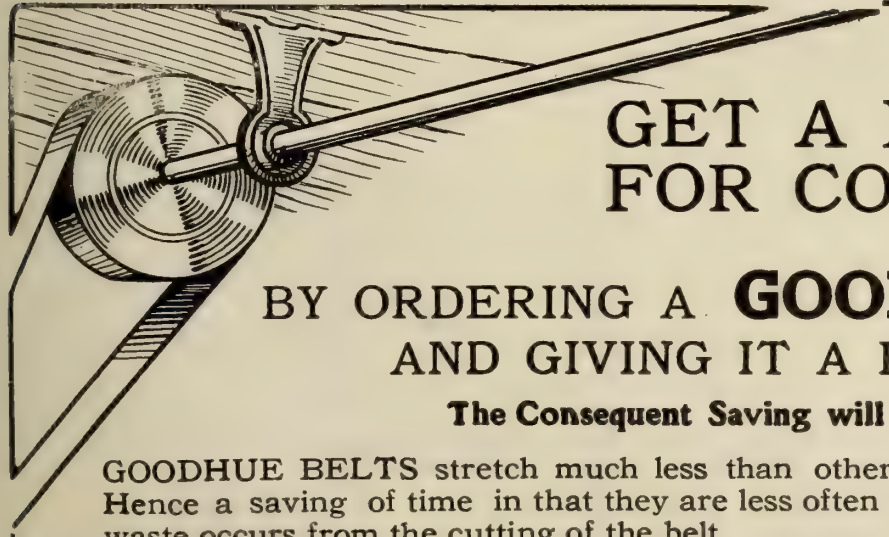


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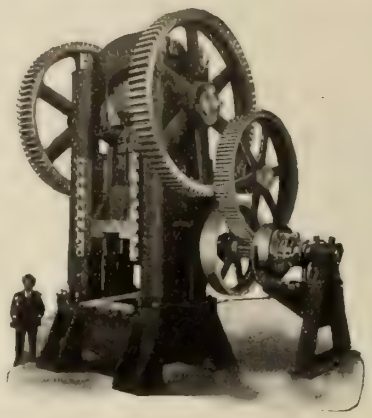
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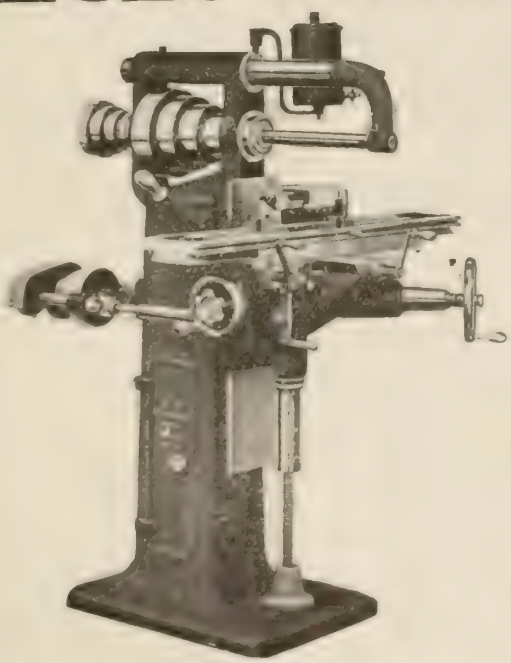
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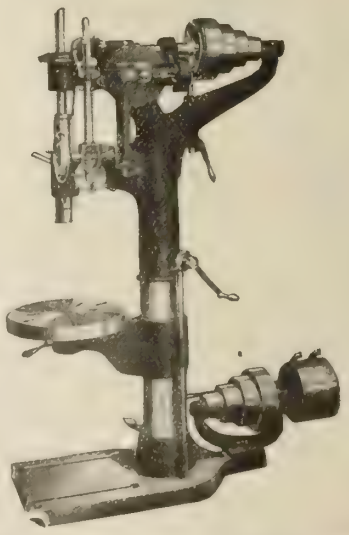
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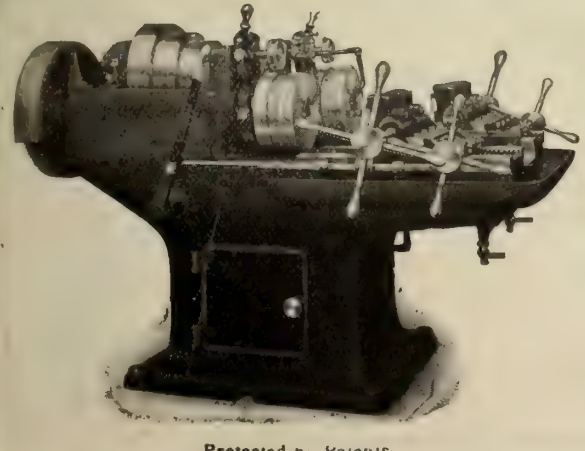
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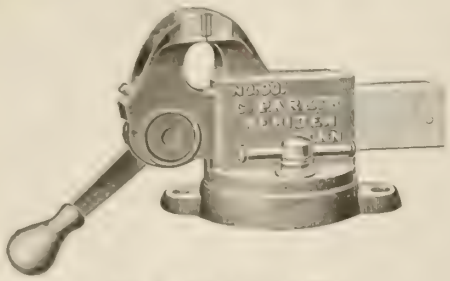
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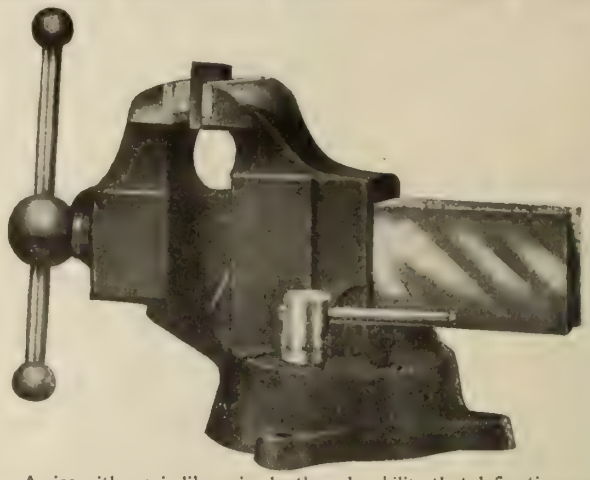
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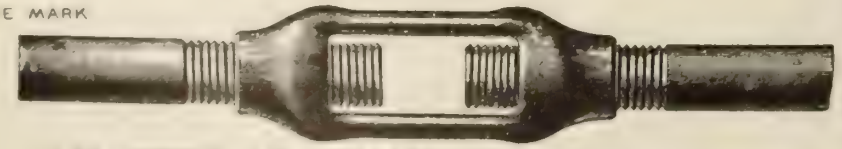
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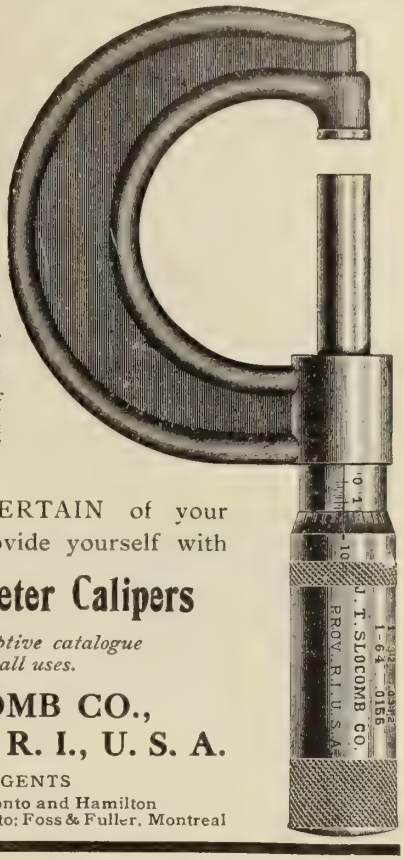
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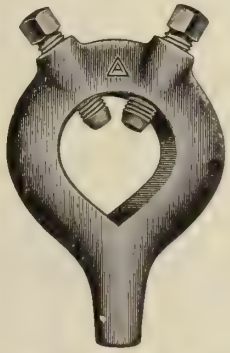
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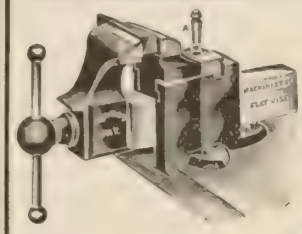
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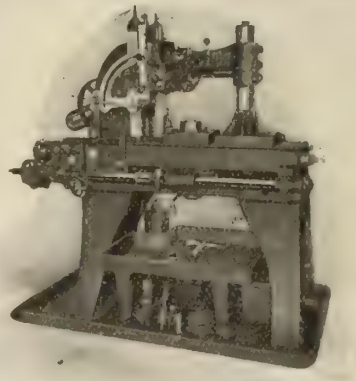
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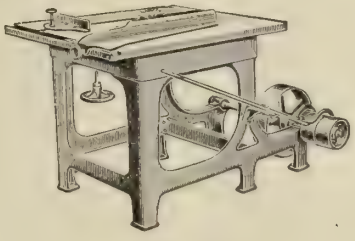
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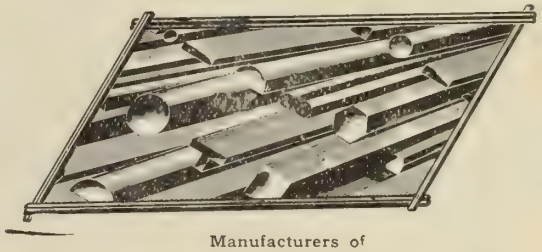
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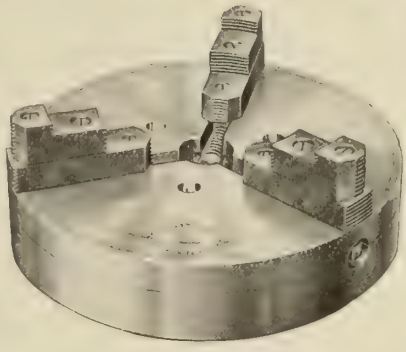


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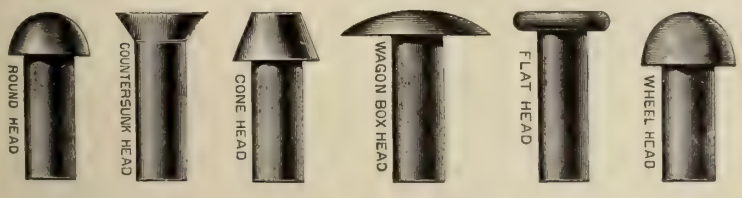
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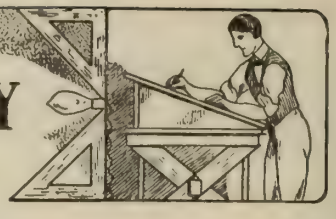
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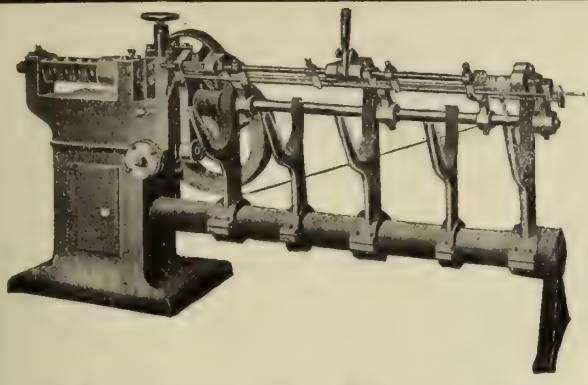
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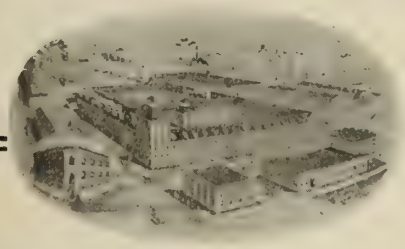
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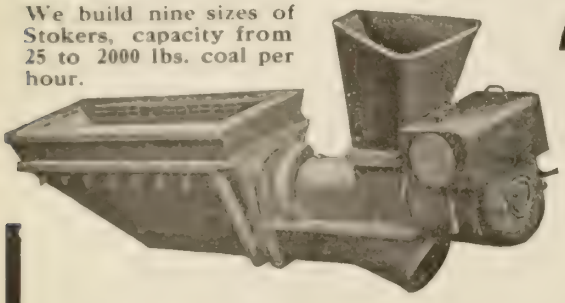
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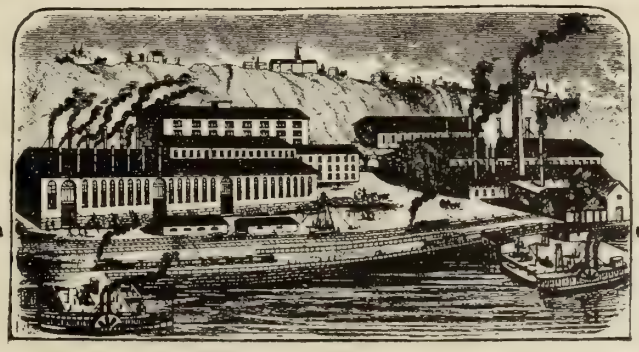
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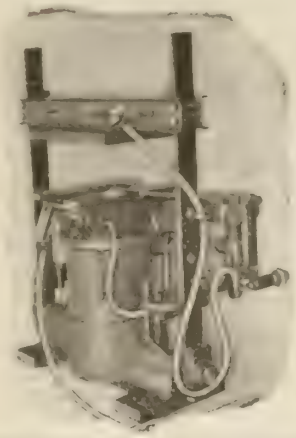
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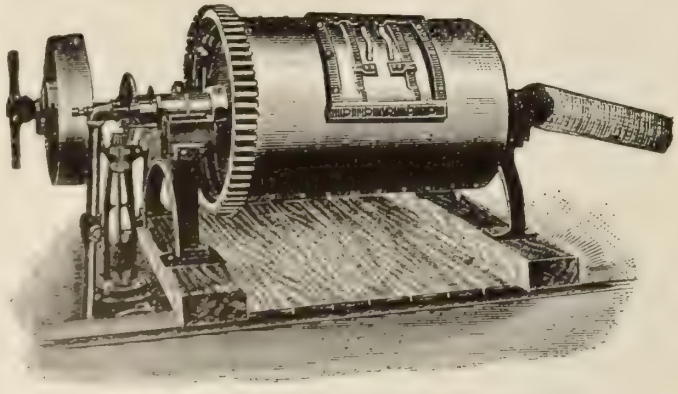
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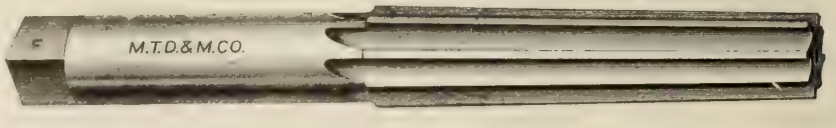
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Pratt & Whitney Co., Hartford Conn.

Draft, Mechanical.

W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawing Tables

R. E. Kidder

Dredging Machinery.

Browning Engineering Co., Cleveland

Drill Presses.

Garvin Machine Co., New York

Drilling Machines, Locomotive and Multiple Spindle.

John Bertram & Sons Co., Dundas, Ont.
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.

John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Foss & Hill, Montreal
London Mach. Tool Co., Hamilton.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Sensitive.

H. G. Barr, Worcester, Mass
Mussens, Limited Montreal
Niles-Bement-Pond Co., New York

Drilling Machines, Upright and Horizontal.

John Bertram & Sons Co., Dundas, Ont
Foss & Hill, Montreal
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
R. McDougall Co., Galt
Niles-Bement-Pond Co., New York

Drilling Posts.

The Keystone Mfg. Co., Buffalo

Drills, Bench.

London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.
United States Electrical Tool Co., Cincinnati

Drills, Blacksmith and Bit Stock.

Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Canadian Rand Co., Montreal
Cumming, J. W., New Glasgow, N.S.

Drills, Electric and Portable.

Holden Co., Montreal
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
United States Electrical Tool Co., Cincinnati

Drills, High Speed.

W. F. & John Barnes Co., Rockford, Ill.
Hermann Boker & Co., Montreal
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb, Montreal
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal
Pratt & Whitney Co., Hartford, Conn.
Standard Machine Tool Co., South Bend, Ind.

Drills, Oil Tube.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Drills, Pneumatic.

John F. Allen Co., New York
Canadian Rand Co., Montreal
Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.

Armstrong Bros. Tool Co., Chicago.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler
The Keystone Mfg. Co., Buffalo, N.Y.
Morse Twist Drill and Machine Co., New Bedford
Chas. Parker & Co., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.

Drills, Rock.

Canadian Rand Co., Montreal.
Holden Co., Montreal

Drills, Track.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford

Drills, Twist.

The Canadian Fairbanks Co., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Morse Twist Drill and Machine Co. New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.

Drill Sockets.

Morse Twist Drill and Machine Co., New Bedford

Dry Kiln Cars and Equipment.

Sheldons Limited, Galt

Dump Cars.

Rupert G. Bruce Co., Ltd., Toronto
Browning Engineering Co., Cleveland
The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dynamos and Electrical Supplies.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.
Federal Eng. & Supplies, Ltd., Toronto
Hall Engineering Works, Montreal, Que.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

Electric Welding

Standard Welding Co., Cleveland, O.

Elevators and Buckets.

Francis Hyde & Co., Montreal.
Watercus Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery and Emery Wheels.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton.
Garvin Machine Co., New York
Francis Hyde & Co., Montreal
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.

Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Canadian Yeates Gordon Co., Hamilton
Gardner, Robt. & Son Montreal
Francis Hyde & Co., Montreal.

Engineers, Marine and Mechanical.

Canadian General & Shoe Machinery Co. Levis, Que.

Engines, Marine.

John Inglis Co., Ltd., Toronto
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engineers' Supplies.

Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.

The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Fielding & Platt, Ltd., Gloucester, Eng.
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engines, Steam.

Canadian Yeates Gordon Co., Hamilton
The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst, N.S.
Scotia Eng. Co., Montreal
Sheldons Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Equipment, Shop.

Garvin Machine Co., New York

Escutcheon Pins.

Parmenter & Bulloch Co. Gananoque

Exhaust Heads.

The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.

Canadian Westinghouse Co., Hamilton
Foss & Hill, Montreal
Matthews & Yates, Manchester Eng.
Sheldons Limited Galt, Ont.
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.

The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford.

Files.

Nicholson File Co., Port Hope, Ont.
Simonds Mfg. Co., Fitchburg, Mass.

Flanges.

Dart Union Co., Ltd., Toronto

Forges.

Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.
Independent Pneumatic Tool Co. Chicago, Ill.
W. S. Rockwell Co., New York
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.

Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York

Forgings, Drop, Automobile and Locomtive

Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co., Toronto

Friction Clutch Pulleys, etc

The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs

Montreal Steel Works, Montreal

Furnaces, Steel Heating.

Standard Engineering Co., Toronto
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Sheldons Limited, Galt.

Gas Producer Linings.

Harbison-Walker Refractories Co., Pittsburg

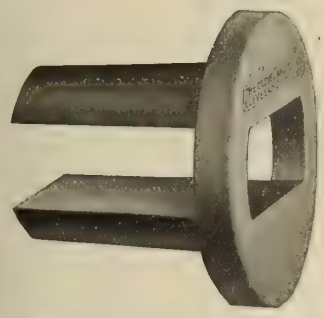
Gas Producer Plants.

Bain & Mitchell, Montreal
The Canadian Fairbanks Co., Montreal
Fielding & Platt, Ltd., Gloucester, Eng

Gauges, Standard.

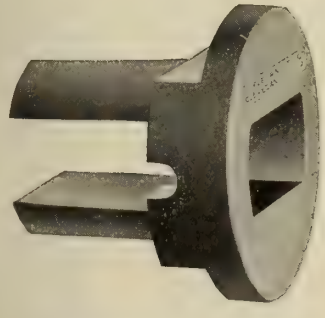
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn

The Strongest Drive for Large Size 'Flatwist' Drills



"Paragon" Collet No. 800-A

is practically an interchangeable taper shank for "Flatwist" drills. The drive is on the HIGH SPEED STEEL TANG.



"Paragon" Collet No 800-B

provides a powerful additional drive at the lower and stronger end of the shank by means of a projection which mortises into the spindle.

YOUR heavy duty drilling can be accomplished with precision by using the powerful compact drive provided by these

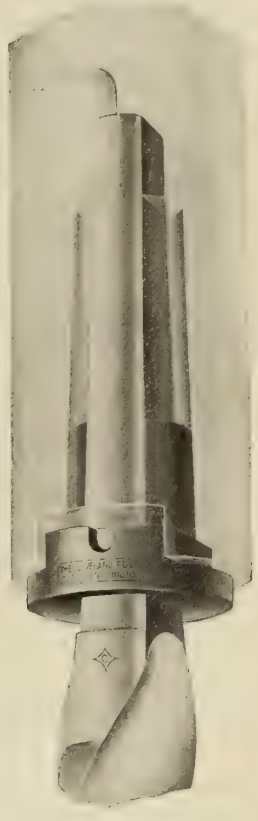
"PARAGON" COLLETS

Pat. Nov. 22, 1910

THEY allow drilling at higher speeds with absolutely no twisted-off tangs. "Paragon" Collets eliminate cumbersome extension reducing sockets by simply adapting the Nos. 5 and 6 "Paragon" shanks directly to the drill press spindles.

"Paragon" Drills are forged hot from flat bars of the best high-speed steel, without weld or joint. The combination of the "Paragon" Drill and Collet means ***efficiency.***

May we send our Folder No. 31C giving the facts and prices?



"Paragon" Collet No. 800-B

showing its engagement with the lower end of the spindle—the strongest known drive for "FLATWIST" DRILLS.

The CLEVELAND Twist Drill Co.

New York CLEVELAND, OHIO. Chicago

Gear-Cutting Machinery.

The Canadian Fairbanks Co., Montreal
Foss & Hill, Montreal
Canadian Yeates Gordon Co., Hamilton
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton
Morse Twist Drill and Machine Co., New Bedford
Niles Bement Pond Co. New York.
Pratt & Whitney Co. Hartford, Conn.
Schuchardt & Schutte, New York

Gears, Cut, Mortise, Angle, Worm.

Armstrong Bros., Toronto
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
John Millen & Son, Montreal
New Process Raw Hide Co., Syracuse
Waterous Engine Works Co., Brantford

Gears, Rawhide.

Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
John Millen & Son, Montreal
New Process Raw Hide Co., Syracuse
Waterous Engine Works Co., Brantford

Generators, Electric.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton
Hall Engineering Works, Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto
Toronto & Hamilton Electric Co., Hamilton

Grates, Shaking and Dumping

Standard Engineering Co., Toronto

Graphite.

Rupert G. Bruce Co., Ltd., Toronto
Jos. Dixon Crucible Co., Jersey City
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
John Millen & Son, Montreal
Stevens, F. B., Detroit, Mich.

Grease Cups.

Peterboro Lubricator Mfg. Co., Peterboro

Grinders, Automatic Knife.

Canadian Hart Wheels Ltd., Hamilton
W. H. Banfield & Son, Toronto.
Waterous Engine Works Co., Brantford.

Grinders, Centre, Pedestal and Bench.

Canadian Hart Wheels Ltd., Hamilton
Niles-Bement-Pond Co., New York.
United States Elec. Tool Co., Cincinnati
Morse Twist Drill and Machine Co., New Bedford

Grinders, Cutter.

Bath Grinder Co., Fitchburg, Mass.
Modern Tool Co. Erie, Pa.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

Grinders, Disc.

Armstrong Bros. Co., Chicago
Bath Grinder Co., Fitchburg, Mass.
Valley City Machine Works, Grand Rapids

Grinders, Drill.

Garvin Machine Co., New York

Grinders, Portable Electric, Hand, Tool Post and Bench

Holden Co., Montreal
[illegible] Tool Co., Cincinnati

Grinders, Tool and Holders.

Armstrong Bros. Tool Co., Chicago
W. F. & John Barnes Co., Rockford, Ill
Bath Grinder Co., Fitchburg, Mass.
Blount, J. G. & Co., Everett, Mass.

Grinding and Polishing Machines, Portable and Pneumatic.

Bath Grinder Co., Fitchburg, Mass.
The Canadian Fairbanks, Montreal
Canadian Hart Wheels Ltd., Hamilton
Dominion Abrasive Wheel Co., [illegible]
Gardner, Robt. & Son, Montreal
Garvin Machine Co., New York
Hall & Sons, John H., Brantford
Independent Pneumatic Tool Co., Chicago, Ill
Modern Tool Co. Erie, Pa
Niles-Bement-Pond Co., New York

Grinding Wheels.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton
Carborundum Co., Niagara Falls
Dominion Abrasive Wheel Co., Toronto
Mussens Limited, Montreal.

Hack Saw Frames.

Mussens Limited, Montreal
Simonds Mfg. Co., Fitchburg, Mass.

Hammers, Drop and Belt Driven.

Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland
Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal
London Mach. Tool Co., Hamilton, Ont.
Niles Bement Pond Co., New York.

Hammers, Pneumatic

Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Canadian Rand Co., Montreal

Hammers, Steam.

John Bertram & Sons Co. Dundas, Ont
Canadian Yeates Gordon Co., Hamilton
London Mach. Tool Co., Hamilton, Ont
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Hand Hoists & Trolleys.

Whiting Foundry Equipment Co., Harvey, Ill.

Hangers.

Fay, J. A. & Egan Co., Cincinnati
Foss & Hill, Montreal
Gardner, Robt., & Son, Montreal
The Goldie & McCulloch Co., Galt.
Owen Sound Iron Works Co., Owen Sound
Positive Clutch & Pulley Works, Toronto
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

Heating Apparatus.

Darling Bros., Ltd., Montreal
Matthews & Yates, Manchester, Eng.
Sheldons Limited, Galt.

Hobbing Machine.

Schuchardt & Schutte, New York

Hoists, Electric and Pneumatic.

Advance Machine Works Ltd., Walkerville, Ont.
Northern Eng. Works, Detroit

Hose, Air and Steam

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago

Hydraulic Accumulators.

The Canadian Fairbanks Co., Montreal
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

Hydraulic Machinery.

Canadian Yeates Gordon Co., Hamilton
The John Inglis Co., Ltd., Toronto
Fielding & Platt, Ltd., Gloucester, Eng.

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.
Schuchardt & Schutte, New York

Index Centres.

Garvin Machine Co., New York

Inspecting Engineers.

Walter R. Duckworth, Montreal

Interlocking Plants and Signals

Montreal Steel Works, Montreal

Intersections, Railway

Montreal Steel Works, Montreal

Iron Filler.

Imperial Waste & Metal Co., Montreal

Jacks.

The Canadian Fairbanks Co., Montreal
Francis Hyde & Co., Montreal
H. & E. Lifting Jack Co., Waterville, Que.
Montreal Steel Works, Montreal
Norton, A. O., Cowicook, Que.

Jacks, Compressed Air.

Canadian Rand Co., Montreal

Jacks, Pit and Track

The Canadian Fairbanks Co., Montreal
Montreal Steel Works, Montreal

Jaws, Face Plate.

Cushman Chuck Co., Hartford, Conn.
S. E. Horton Machine Co., Windsor Locks, Conn.

Key Seaters.

Garvin Machine Co., New York

Lag Screw Gimlet Pointers.

National Machinery Co., Tiffin, Ohio

Lamps, Arc and Incandescent.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.

Lathe Dogs.

Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford, Conn.

Lathes Bench.

W. F. & John Barnes Co., Rockford, Ill
Blount, J. G. & Co., Everett, Mass.
The Canadian Fairbanks Co., Montreal
Hardinge Bros. Inc., Chicago
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Engine.

John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Champion Tool Works Co., Cincinnati, O
Cincinnati Lathe & Tool Co., Cinn., O
Fay & Scott, Dexter, Maine
Foss & Hill, Montreal
Gardner, Robt., & Son, Montreal
Garvin Machine Co., New York
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
R. McDougall Co., Galt
Mussens Limited, Montreal.
New Haven Mfg Co., New Haven, Conn
Niles-Bement-Pond Co., New York.
Von Wyck Machine Tool Co., Cincinnati

Lathes, Patternmakers.

Fay & Scott, Dexter, Maine

Lathes, Screw Cutting.

John Bertram & Sons Co., Dundas, Ont.
Foss & Hill, Montreal
London Mach. Tool Co., Hamilton, Ont.
Miami Valley Mach. Tool Co., Dayton, O
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York

Lathes, Spinning.

Bliss E. W., Co., Brooklyn, N.Y.

Lathe, Turret and Speed.

John Bertram & Sons Co., Dundas, Ont.
Blount, J. G. & Co., Everett, Mass.
Bullard Machine Tool Co., Bridgeport, C.
Cincinnati Lathe & Tool Co., Cinn., O
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
The Pratt & Whitney Co., Hartford, Conn
Warner & Swasey Co., Cleveland, O.

Link Belting.

The Canadian Fairbanks Co., Montreal
Jones & Glassco, Montreal
Waterous Engine Works Co., Brantford

Linoleum Mill Machinery.

Bertrams Limited, Edinburgh, Scotland

Locomotives, Air, Steam.

Canadian Rand Co., Montreal.

Locomotives, Electrical.

Canadian Westinghouse Co., Hamilton

Locomotives, Industrial.

Canadian Yeates Gordon Co., Hamilton

Lubricating Plumbago.

Rupert G. Bruce Co., Ltd., Toronto
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal.
John Millen & Son, Montreal

Machine Divided Rules.

Lufkin Rule Co., Saginaw, Mich.

Machine Tool Attachments.

The S. E. Horton Machine Co., Windsor Locks, Conn.

Machinery Dealers.

The Canadian Fairbanks Co., Montreal.
Canadian Yeates Gordon Co., Hamilton
Mussens Limited, Montreal.
The Smart-Turner Machine Co., Hamilton
Schuchardt & Schutte, New York

Machinery Guards

Canada Wire Goods Mfg. Co., Hamilton

Machinists' Scales and Small Tools.

The Canadian Fairbanks Co., Montreal
Lufkin Rule Co., Saginaw, Mich.

Magnets, Lifting.

Browning Engineering Co., Cleveland
Schuchardt & Schutte, New York

Malleable Iron Furnaces.

Francis Hyde & Co., Montreal.
Standard Engineering Co., Toronto

Mandrels.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
John Millen & Son, Montreal
Morse Twist Drill and Machine Co., New Bedford
The Pratt & Whitney Co., Hartford, Conn

Maple Cogs.

Waterous Engine Works Co., Brantford.

Meters, Electrical.

Canadian Westinghouse Co., Hamilton

Mill Machinery.

The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst, N.S.
Waterous Engine Co., Brantford.

Milling Attachments.

Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York,
Pratt & Whitney, Hartford, Conn.

Milling Machines, Horizontal and Vertical.

Becker Milling Machine Co., Hyde Park, Mass
Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Plain, Bench and Universal.

Becker Milling Machine Co., Hyde Park Mass
Cincinnati Milling Machine Co., Cincinnati
Foss & Hill, Montreal
Garvin Machine Co., New York
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

Milling Machines, Profile.

Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal.
Garvin Machine Co., New York
Schuchardt & Schutte, New York

Milling Tools.

Brown & Sharpe Mfg Co., Providence, R.I
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited Montreal.
Pratt & Whitney Co., Hartford, Conn.

Mine Cars and Hitchings.

The Canadian Fairbanks Co., Montreal

Mining Machinery.

The Canadian Fairbanks Co., Montreal
Canadian Rand Co., Montreal.
Holden Co., Montreal
The John Inglis Co., Ltd., Toronto
T. & H. Electric Co. Hamilton.
Waterous Engine Works Co,, Brantford

Mortising Machines.

Jones & Glassco, Montreal

Motors, Electric.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

Motors, Air.

Canadian Rand Co., Montreal.
Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago.

Multiple Index Centres.

Garvin Machine Co., New York

Nail Sets.

The Keystone Mfg. Co., Buffalo, N.Y.



ACCURACY

To make Twist Drills that will do absolutely accurate work requires the greatest skill—years of experience and the most careful attention to each detail of manufacture.

To secure the greatest wearing quality requires the best of steel, tempered to exactly the correct degree of hardness. Not all Twist Drills attain these two essentials, but

"W & B-DIAMOND"

Twist Drills do and we ***guarantee*** them to be of ***highest quality*** and ***accurate to size.***

We make them from Carbon Steel and Vanadium High Speed Steel and carry the largest stock in Canada.

The "Hercules" High Speed Twist Drill shown on this page is one of our many types and is ***twisted*** while hot from Vanadium High Speed Steel.

Write for Catalog No. 74

W & B CO ***TRADE MARKS*** W&B

The WHITMAN & BARNES MFG. CO.

ST. CATHARINES, - ONTARIO

Nut Burring Machines.

Canadian Yeates Gordon Co., Hamilton
National Machinery Co., Tiffin, Ohio

Nut Machines (Hot.)

National Machinery Co., Tiffin, Ohio

Nut Facing and Bolt Shaving Machines.

Canadian Yeates Gordon Co., Hamilton
Garvin Machine Co., New York
National Machinery Co., Tiffin, Ohio

Nut Tappers.

John Bertram & Sons Co., Dundas, Ont.
Canadian Yeates Gordon Co., Hamilton
Garvin Machine Co., New York
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler
London Mach. Tool Co., Hamilton
National Machinery Co., Tiffin, Ohio

Oil Extractors.

Darling Bros., Ltd., Montreal

Oil Furnaces.

Rupert G. Bruce Co., Ltd., Toronto

Oil Separators.

The Canadian Fairbanks Co., Montreal
Standard Engineering Co., Toronto

Oil Stones.

Canadian Hart Wheels Ltd., Hamilton.
Carborundum Co., Niagara Falls N.Y.
Whiting Foundry Equipment Co., Harvey Ill.

Pans, Lathe.

Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop.

Cleveland Wire Spring Co., Cleveland

Paper Mill Machinery.

Bertrams Limited, Edinburgh, Scotland

Patent Solicitors.

Blackmore, Cote & Co., Toronto
Hanbury A. Budden, Montreal.
Fetherstonhaugh & Co., Montreal and Toronto
Fetherstonhaugh, Dennison & Co., Toronto
Foss & Hill, Montreal
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

Patterns.

John Carr, Hamilton, Ont.
Galt Malleable Iron Co., Galt
Hamilton Pattern Works, Hamilton.

Phosphor Bronze Castings.

Talisman Brass & Metal Co., Hamilton

Pig Iron.

Stevens, F. B., Detroit, Mich.

Pipe Cutting and Threading Machines.

Butterfield & Co., Rock Island, Que.
The Canadian Fairbanks Co., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill, Montreal
Garvin Machine Co., New York
John H. Hall & Sons, Brantford
Joshua Heap & Co., Ashton-on-Lyne Eng.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
R. McDougall Co., Galt
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Williams Tool Co., Erie, Pa.

Pipe (Second Hand.)

Imperial Waste and Metal Co., Montreal

Planer Drives, Electrical.

Lancashire Dynamo and Motor Co., Ltd., Toronto

Planer Jacks.

Armstrong Tool Bros. Co., Chicago

Planers, Standard and Rotary.

John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal.
Canada Machinery Corporation, Ltd., Galt, Ontario
Gardner, Robt. & Son, Montreal
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal
New Haven Mfg. Co., New Haven, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

Planing and Shaping Machinery.

Garvin Machine Co., New York

Pliers.

Canadian Billings & Spencer, Ltd., Welland
Schuchardt & Schutte, New York

Pneumatic Tools.

Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Rand Co., Montreal.
Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.

Polishing Materials.

Rupert G. Bruce Co., Ltd., Toronto
Canadian Hart Wheels Ltd., Hamilton

Power Plant Equipments.

The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal
Goldie & McCulloch Co., Galt, Ont.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto
Waterous Engine Works Co., Brantford

Press Guards.

Jones Safety Device Co., Hamilton, Ont.

Press Screw. (Adjustable.)

W. F. & John Barnes Co., Rockford, Ill.

Presses, Broaching.

Bliss, E. W., Co., Brooklyn, N.Y.

Presses, Drop.

W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Niles-Bement-Pond Co., New York.

Presses, Envelope Die

R. E. Kidder

Presses, Forging.

Bliss, E. W., Co., Brooklyn, N.Y.
The Canadian Fairbanks Co., Montreal
United Engineering & Foundry Co., Pittsburg

Presses, Hydraulic.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
United Engineering & Foundry Co., Pittsburg

Presses, Power.

E. W. Bliss Co., Brooklyn, N.Y.
The Canadian Fairbanks Co., Montreal
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Pressure Regulators.

The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal

Protective Paint.

Jos. Dixon Crucible Co., Jersey City

Pulp Mill Machinery.

Waterous Engine Works Co., Brantford

Pulleys.

The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
The Goldie & McCulloch Co., Galt.
Oneida Steel Pulley Co., Oneida, N.Y.
Owen Sound Iron Works Co., Owen Sound
Positive Clutch & Pulley Works, Toronto
Schuchardt & Schutte, New York
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

Pump Governors.

Darling Bros., Ltd. Montreal
Standard Engineering Co., Toronto.

Pumping Machinery.

The Canadian Fairbanks Co., Montreal
Canadian Rand Co., Montreal.
Canadian Yeates Gordon Co., Hamilton
Darling Bros., Ltd., Montreal
General Supply Co. of Canada, Ottawa.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal, Que.
The John Inglis Co., Ltd., Toronto
London Mach. Tool Co., Hamilton, Ont.
The Smart-Turner Mach. Co., Hamilton

Punches and Dies.

W. H. Banfield & Sons, Toronto.
Bliss, E. W., Co., Brooklyn, N.Y.
Gardner, Robt., & Son Montreal
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
Russell Machine Co., St. Catharines, On.
Schuchardt & Schutte, New York

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E. W. Bliss Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York

Punches, Pneumatic.

Jno. F. Allen Co., New York

Punches, Turret.

London Mach. Tool Co., London, Ont.

Punching Machines, Horizontal.

Bertrams Limited, Edinburgh, Scotland
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Quartering Machines.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.

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Holden Co., Montreal
Montreal Steel Works, Montreal

Rail Braces

Montreal Steel Works, Montreal

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Imperial Waste & Metal Co., Montreal

Rails, Steel

Montreal Steel Works, Montreal

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Francis Hyde & Co., Montreal.
Canadian Rand Co., Montreal

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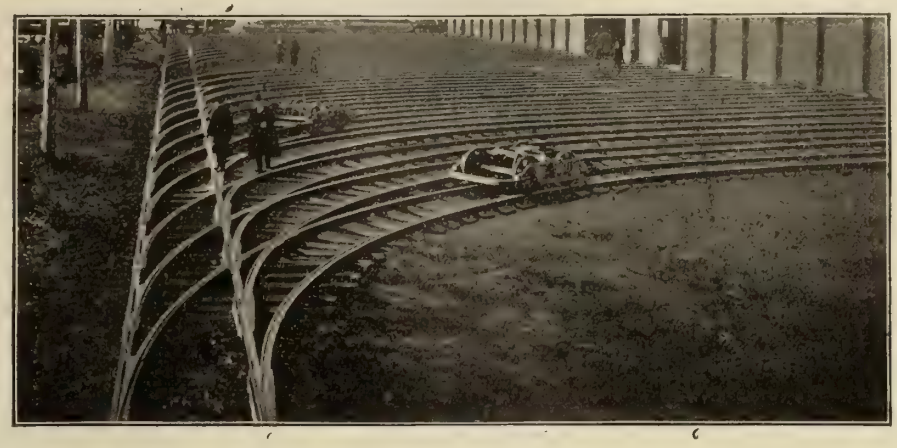
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Vises, Bench.

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Chas. Parker & Co., Meriden, Conn
Prentiss Vise Co., New York

Vises, Pipe.

Chas. Parker & Co., Meriden, Conn
Canadian Yeates Gordon Co., Hamilton
Prentiss Vise Co., New York

Vises, Planer and Shaper.

Canadian Yeates Gordon Co., Hamilton
Niles-Bement-Pond Co., New York.

Vises, Milling Machine.

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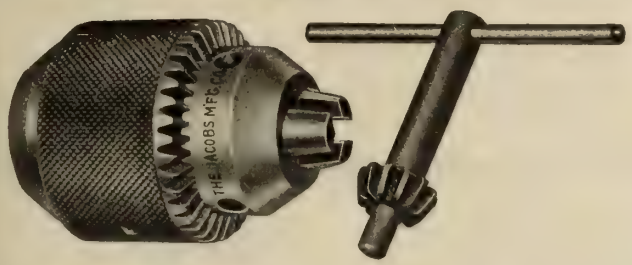
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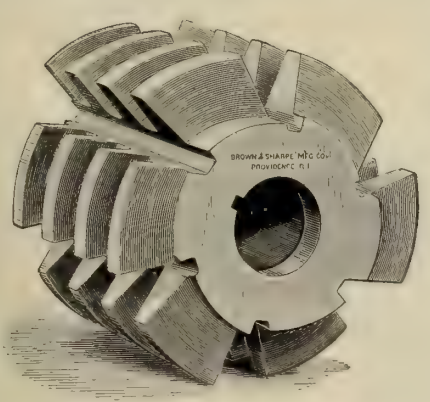
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Northern Engineering Works, Detroit
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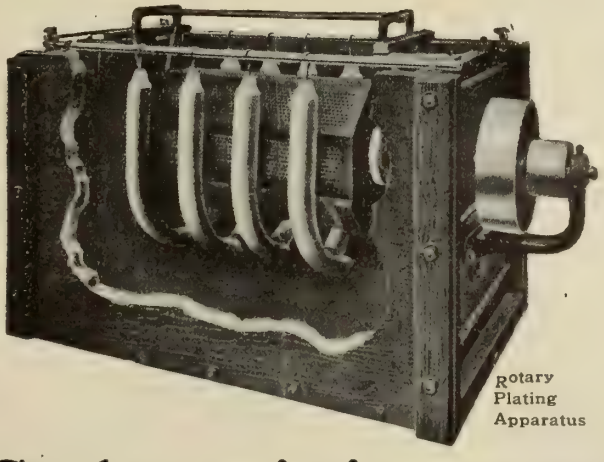
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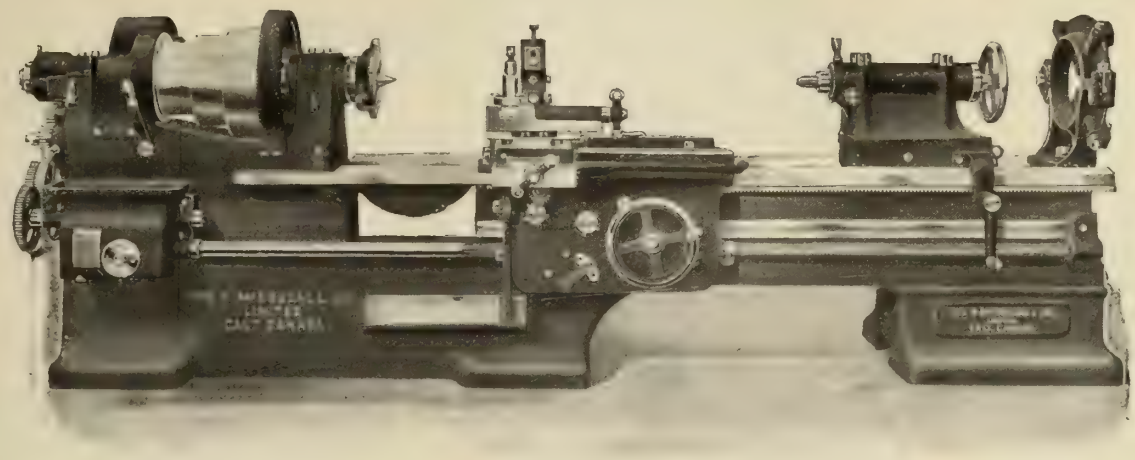
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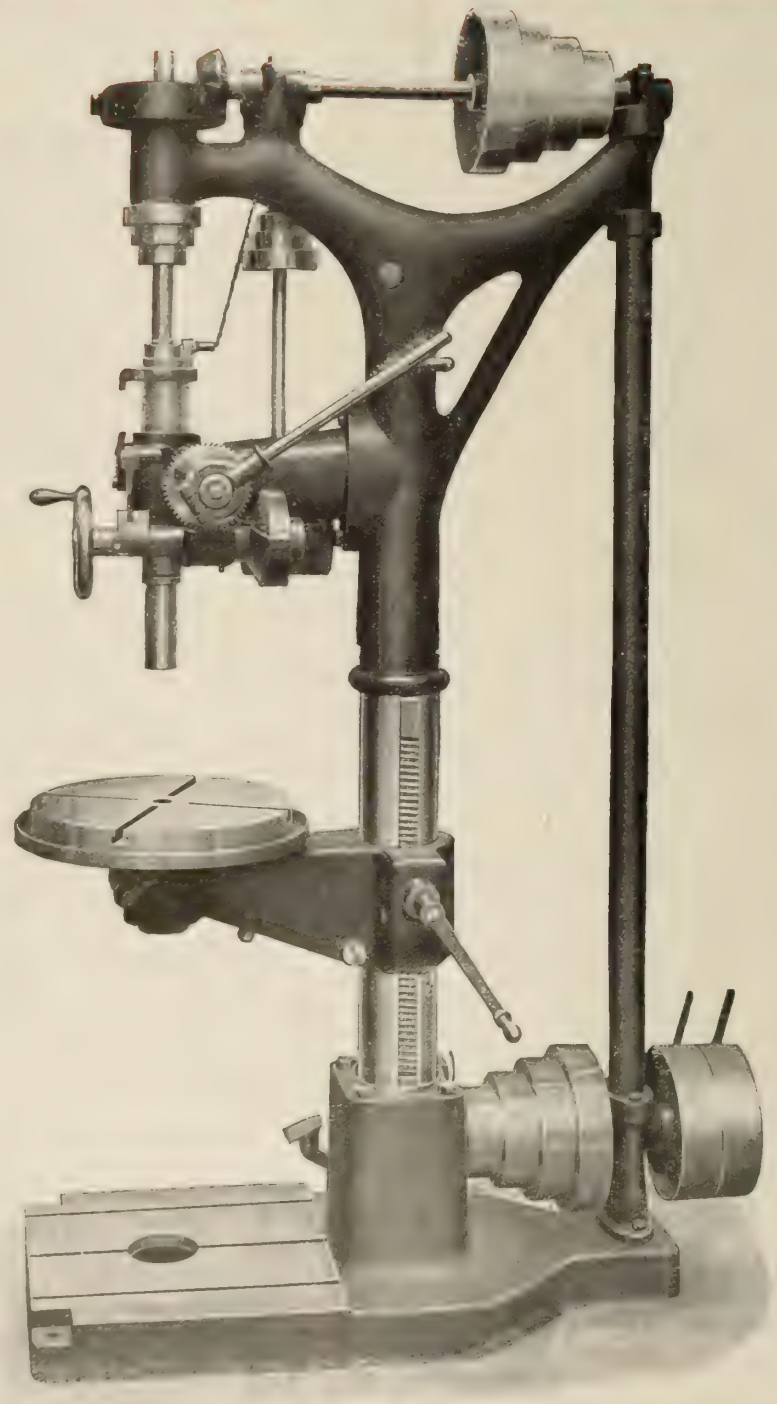
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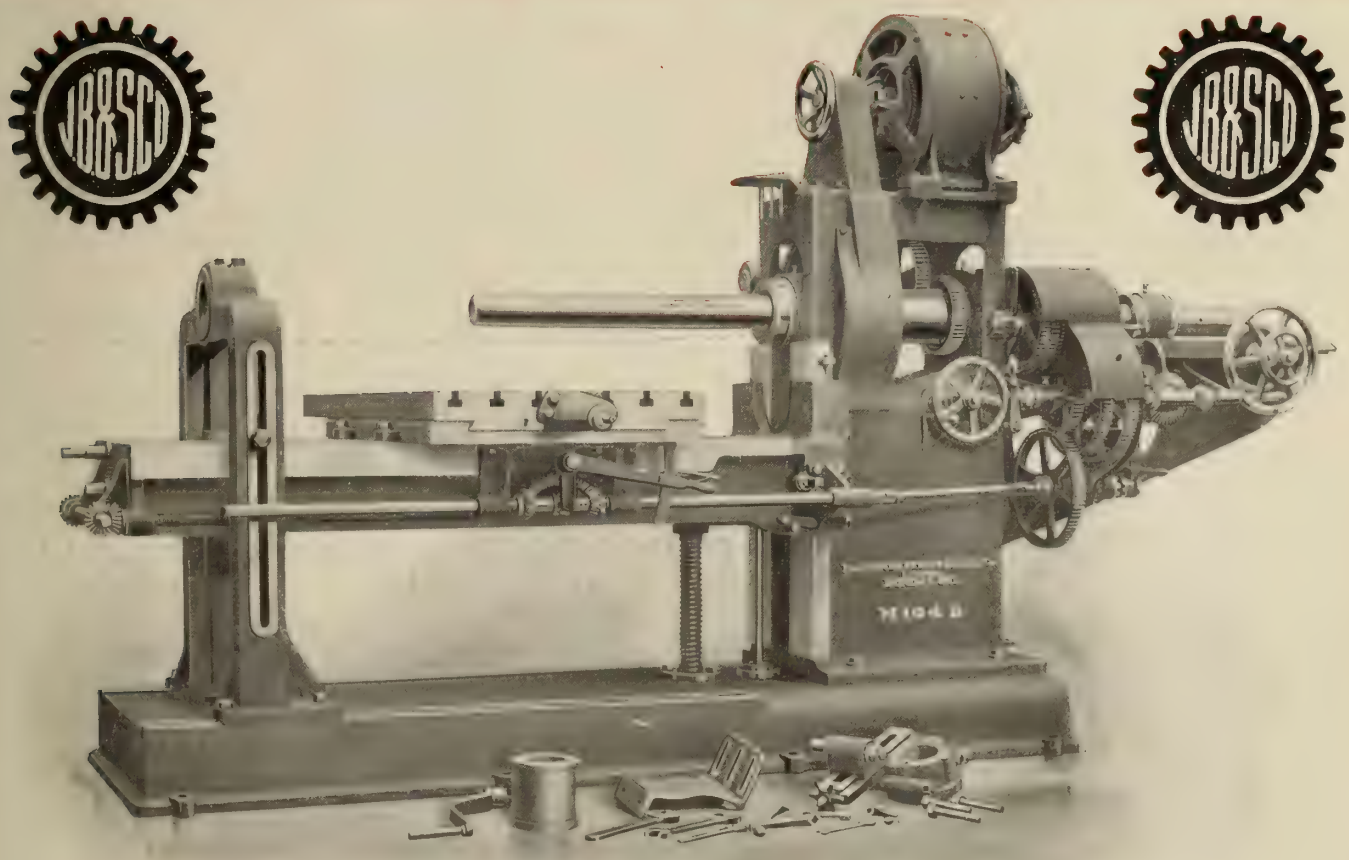
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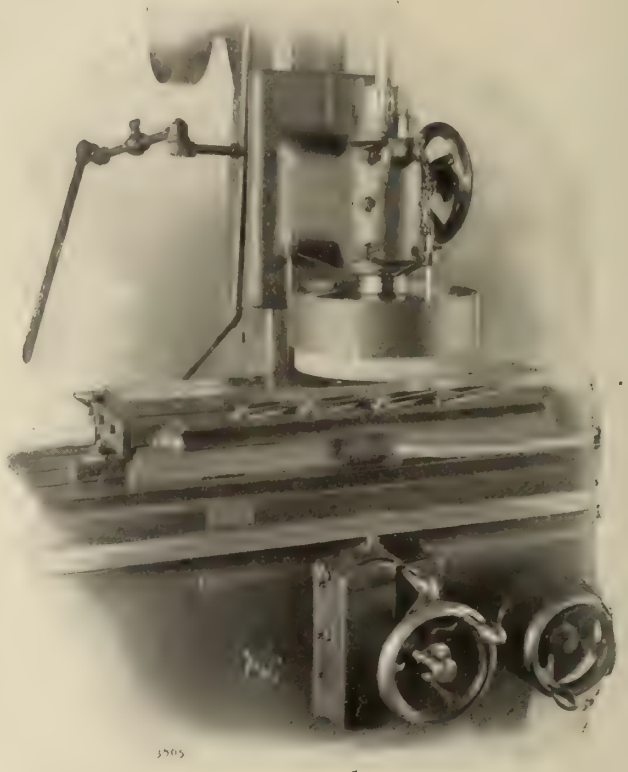
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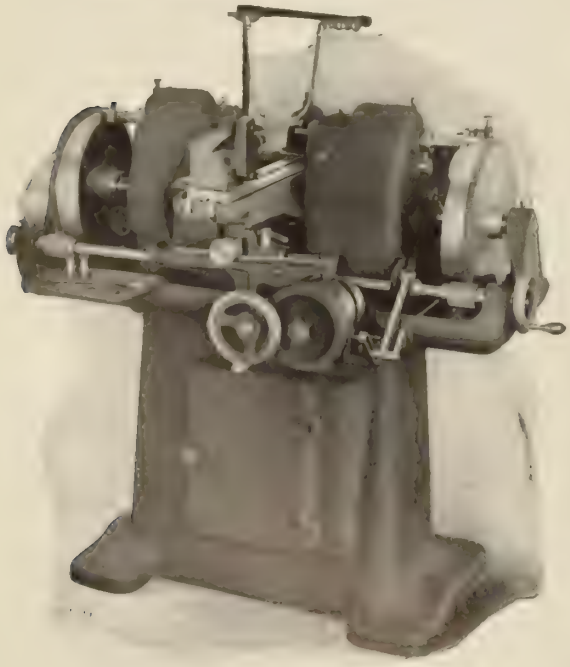
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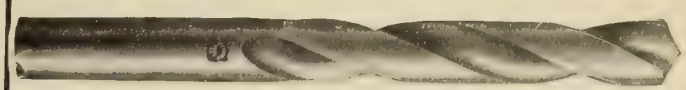
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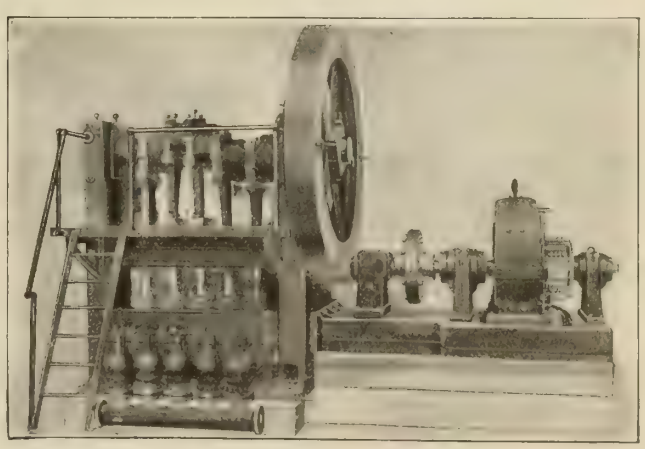
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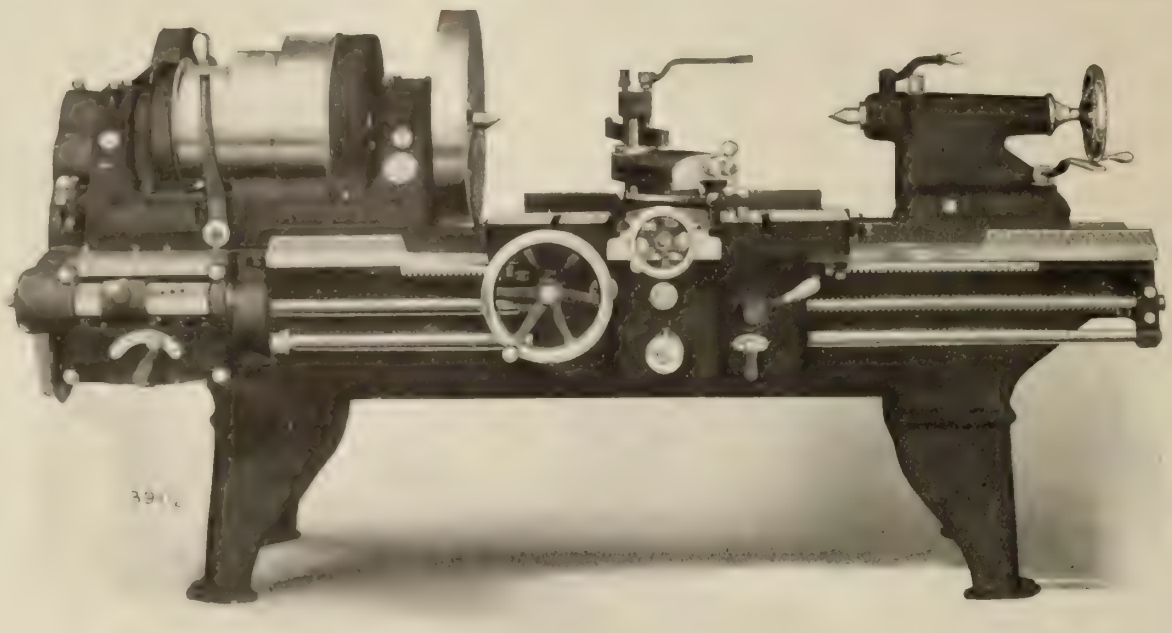


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The London Machine Tool Co., Limited

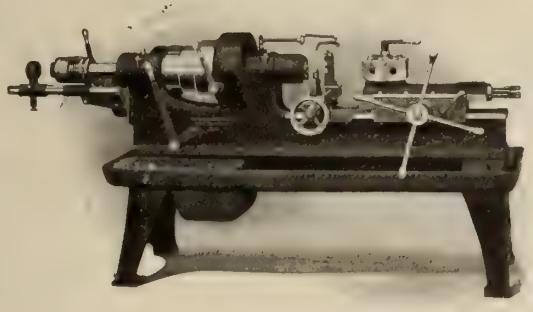
HAMILTON, CANADA

Eastern Agents: Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que.

The advertiser would like to know where you saw his advertisement—tell him.

TURRET LATHES

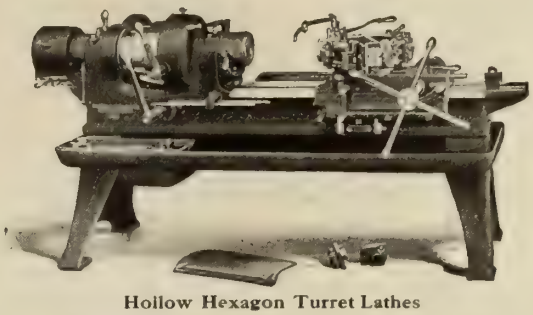
For Brass and Iron Work



Turret Screw Machines

have every facility for rapid, accurate and economical production of screws, studs, bolts and similar pieces from round, square or hexagonal stock.

These machines are built in five sizes, for bar work up to 3⅝ inches in diameter and 14 inches long.



Hollow Hexagon Turret Lathes

have all the facilities known to modern practice for rapid and accurate production.

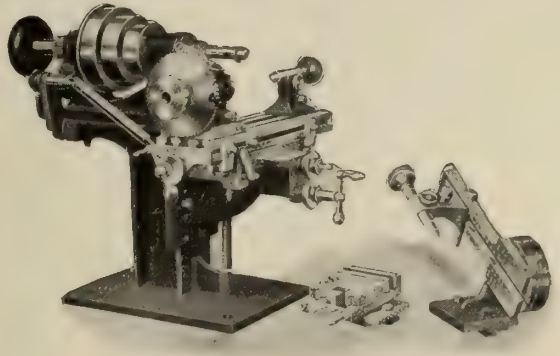
SIZES

No. 1. Turns Diameters up to 1½ inches. Lengths up to 18 inches.
No. 2. Turns Diameters up to 2¼ inches. Lengths up to 24 inches.
No. 3. Turns Diameters up to 3⅛ inches. Lengths up to 36 inches

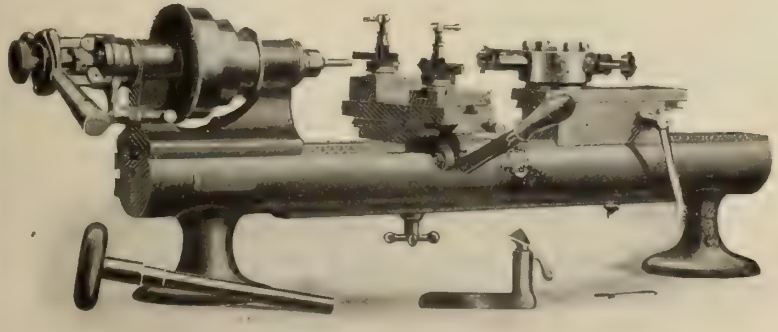
Correspondence invited. Please address nearest office.

The Warner & Swasey Co. Cleveland O. U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams & Wilson, Montreal



Write for Catalog No. 190.



The Hardinge Bench Miller

will do work which cannot be handled on Standard Large Milling Machines, and will do some of the work now being done at a loss on large machines.

AS YOU LIKE IT

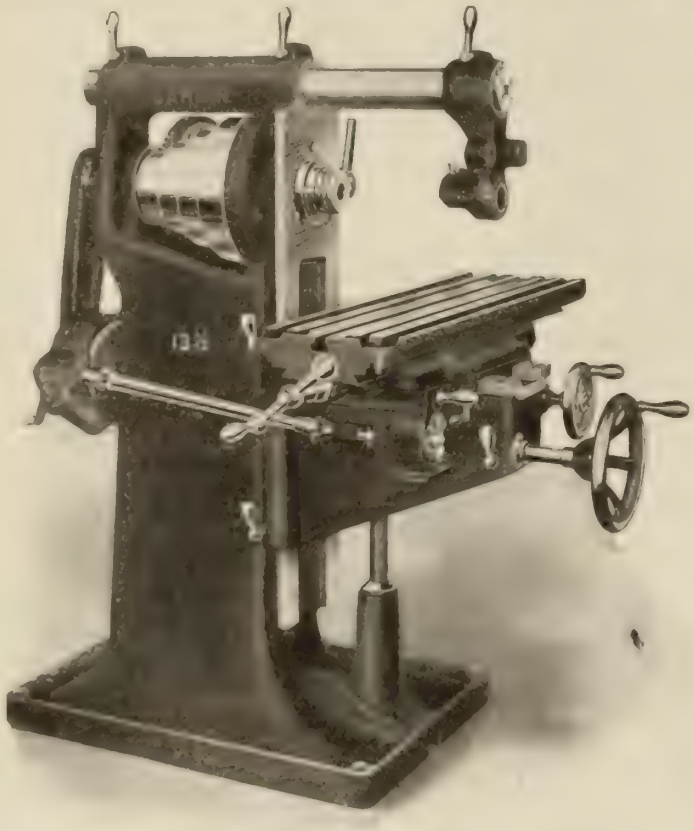
A Bench Lathe, or a Screw Machine, with Automatic Chuck Closer, Double Tool Cross Slide and Turret. Drill, Tap and Die Holders carried in stock.

Hardinge Bros. Inc.

3133-3141 Lincoln Avenue
Chicago - Illinois

GARVIN No. 13½-Mfg. Plain Milling Machines

Known for their Rigidity, Simplicity, Efficiency and Maximum of Output. Best materials used, hardened and ground where necessary, in manufacturing these machines. Made to stand long and hard usage.



No. 13½ Mfg. Plain Milling Machine. Use Code "Acidness."

Machines have many important features found only in GARVIN MILLING MACHINES. Among these are.

SQUARE LOCK SOLID TOP EXTENDED (Patented) KNEE

Lengthening of Slide Fit in Saddle
Two Taper Gibs to Slide Fit
Extending the scraped face of the base
Twelve Change Feed Box. Positive Drive
Hand Wheels Interchangeable
All Speeds and Feeds in geometrical progression, etc.

DIMENSIONS

Length of Automatic Feed of Table	24-in.
Adjustment in Line with spindle	7-in.
Vertical Adjustment under Spindle	19-in.
Size of Table over all	41 x 11½ in.
Distance between Column and Arm Braces	18-in.
Swing under Arm	13-in.
Arbor-hole in Spindle B. & S. Taper	No. 10
Width of Belt required	2½-in.
Changes of Speed by Cone, Back Gears and Countershaft	16
Number of Feed Changes	12
Capacity of Vise Furnished	6x3¾-in.
Domestic shipment, crated weight	2,200 lbs.

FULL DESCRIPTION IN CIRCULAR No. 130

IMMEDIATE DELIVERIES

FOR FURTHER INFORMATION ASK YOUR DEALER OR WRITE US DIRECT

SEND FOR CIRCULAR No. 130

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

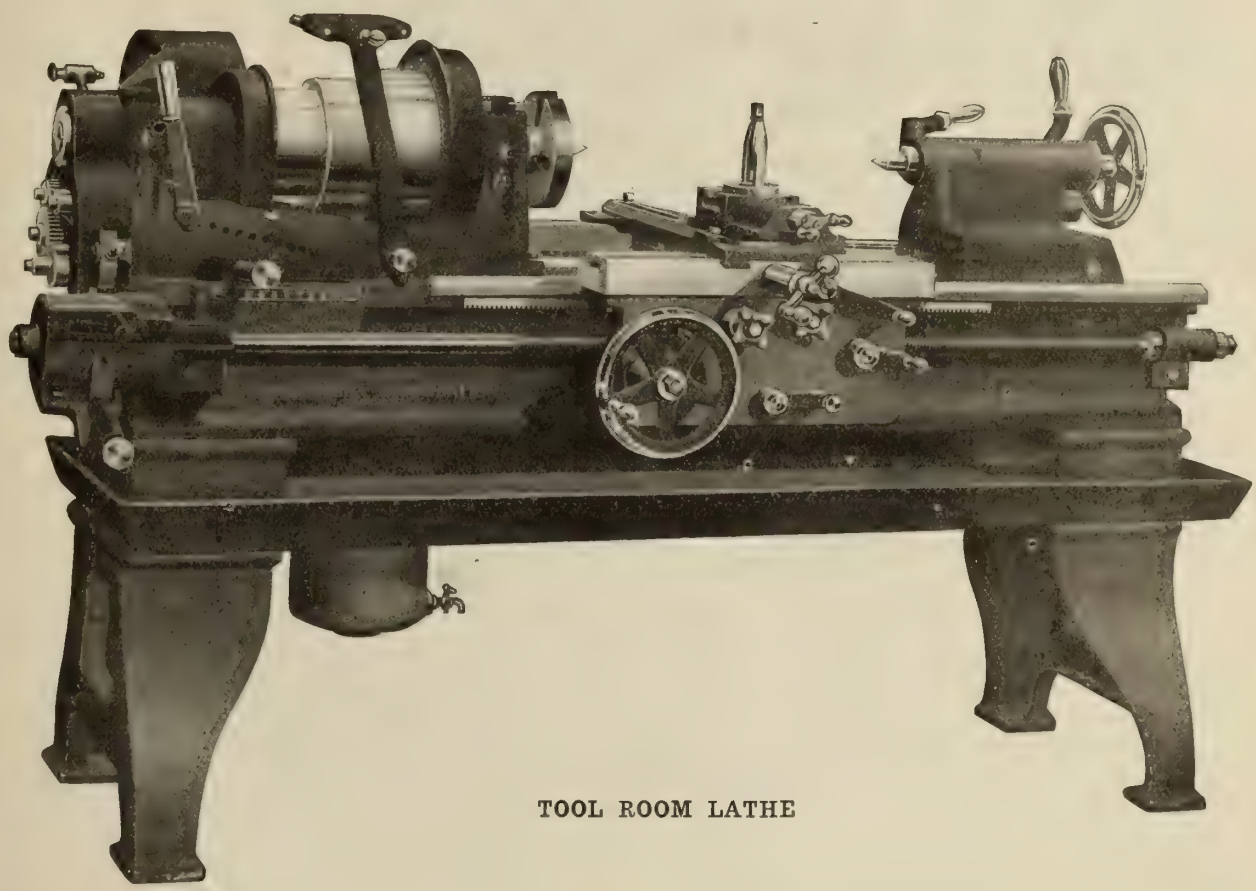
MANUFACTURERS OF Visitors Welcome.

Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.

CANADA MACHINERY CORPORATION, LIMITED

Lathes, Shapers, Planers, Slotters, Punches, Shears

Latest Designs, Finest Workmanship



TOOL ROOM LATHE

Note the appearance of this machine. Hundreds of them in use, and every one giving satisfaction. One grade only and that the best.

Write for Catalogue.

PRICES AND BULLETINS ON APPLICATION.

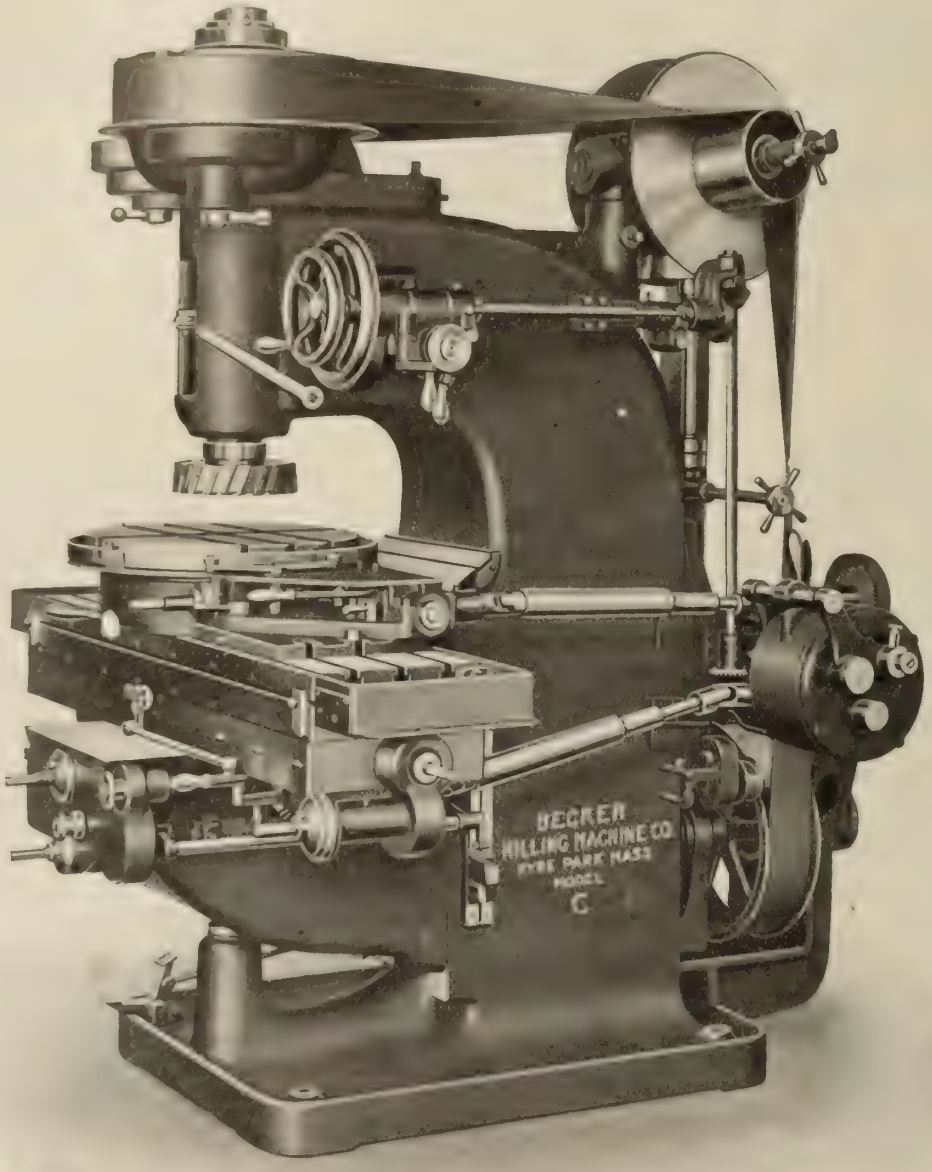
Canada Machinery Corporation, Limited

GALT, ONTARIO

Don't fail to mention "Canadian Machinery" in writing to advertisers.

Becker Vertical Spindle Milling Machines

New Model "C" for Heavy Milling



Some Features of this Machine

THE QUESTION OF POWER CONSUMPTION is one needing special consideration. It is generally considered that all-gear driven spindles consume much more power than an open belt driven machine. Model "C" Vertical can be driven by a 5h.p. variable speed motor. Tests made show a consumption of 4 electrical h.p. when removing 20 cubic inches of cast iron per minute, and when milling soft steel at the rate of 10 cubic inches per minute a 5h.p. consumption. We solicit a comparison of this test with results made by all-gear driven vertical milling machines.

THE ADVANTAGES OF OPERATING A MILLING MACHINE SUCCESSFULLY on heavy cuts without back gears in mesh is too well known to need enlarging upon. We desire only to call special attention to the fact that the Model "C" is designed to perform satisfactorily the average work in the average shop without any spindle gears in mesh. Constant torque of the spindle under direct belt action insures smooth work and reduces chattering, thus making the new Becker a power in its field.

Full specifications on request. Catalogue 56C for general description.

THE BECKER MILLING MACHINE COMPANY, HYDE PARK, MASS., U.S.A.

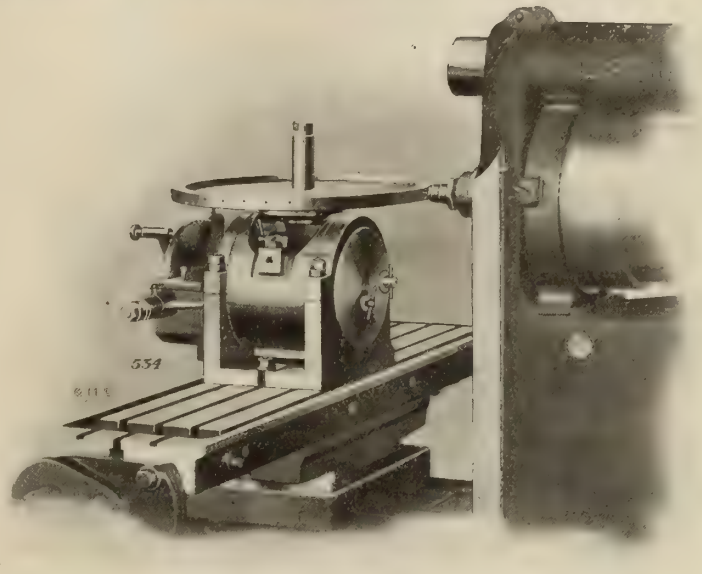
The advertiser would like to know where you saw his advertisement—tell him.

CINCINNATI UNIVERSAL TOOL ROOM MILLERS

Thirty-six holes ¼ inch diameter are spaced on the periphery of a 19 inch disk rigidly held on a 12 inch Index Head. They are first drilled, then bored a trifle under size, and finally reamed to a plug gauge fit with a specially ground ¼ inch end mill. The error between holes is less than one thousandth (—.001 inch). To get such results requires a miller that is accurate all over.

This is a good illustration of the best method of handling work of larger diameter than the index centres will swing. The swivel trunnions on our Dividing Head are large in diameter and fully protected in all positions, insuring permanency of alignment at any angle to which the spindle may be set.

Cincinnati Millers are as famous for their accuracy as for their productive capacity.

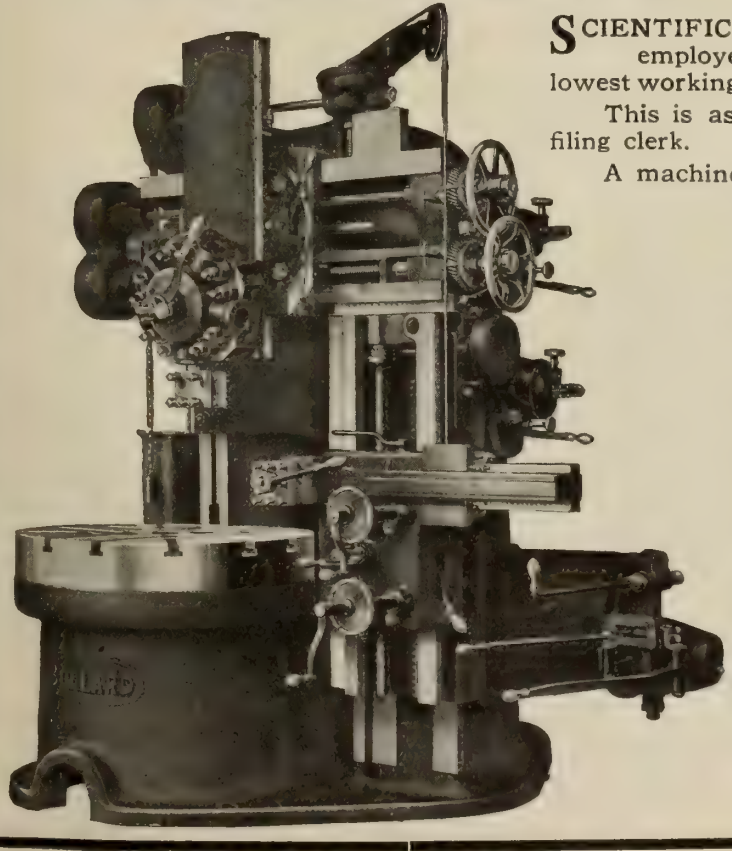


The Cincinnati Milling Machine Company

CINCINNATI, OHIO, U.S.A.

Canadian Agent—H. W. PETRIE, Limited, Toronto, Montreal and Vancouver.

Working as Rapidly at 3 p.m. as at 9 a.m.



SCIENTIFIC Business Management has proved that an employee working from morning until night strikes his lowest working vitality about 3 p.m.

This is as true of the machine tool operator as to the filing clerk.

A machine that is hard to operate—that requires severe, laborious exertion — that requires constant movement to an fro—begins to waste its operator's strength in the morning and leaves him exhausted at the end of the day.

Production suffers — ***quality of work*** suffers.

In the Bullard Vertical Turret Lathe the strain is taken off the operator by ***Power Rapid Traverse.*** Also all levers and handles are directly before him within his reach.

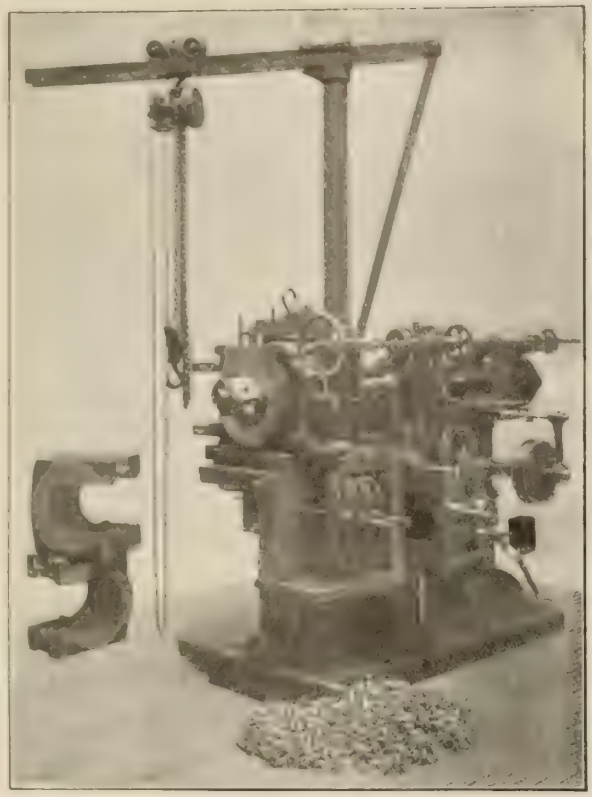
Power Rapid Traverse sets a rapid pace for the operator which he almost unconsciously follows. And by conserving his strength it enables him to work at this rapid pace ***all day.*** Production at 3 p.m. is as ***rapid*** and ***quality*** of work as accurate as at 9 a.m. This means a direct and ***very appreciable*** saving on cost of production of all face plate work within the Vertical Turret Lathe's range.

Ask for Treatise on Face Plate Work, C-15.

The Bullard Machine Tool Co.

BRIDGEPORT, CONN., U.S.A.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1 to 6 inch pipe; Bolts to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2"; ½" to 3"; 1" to 4"; 1½" to 6"; 2" to 8" and 3½" to 12".

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

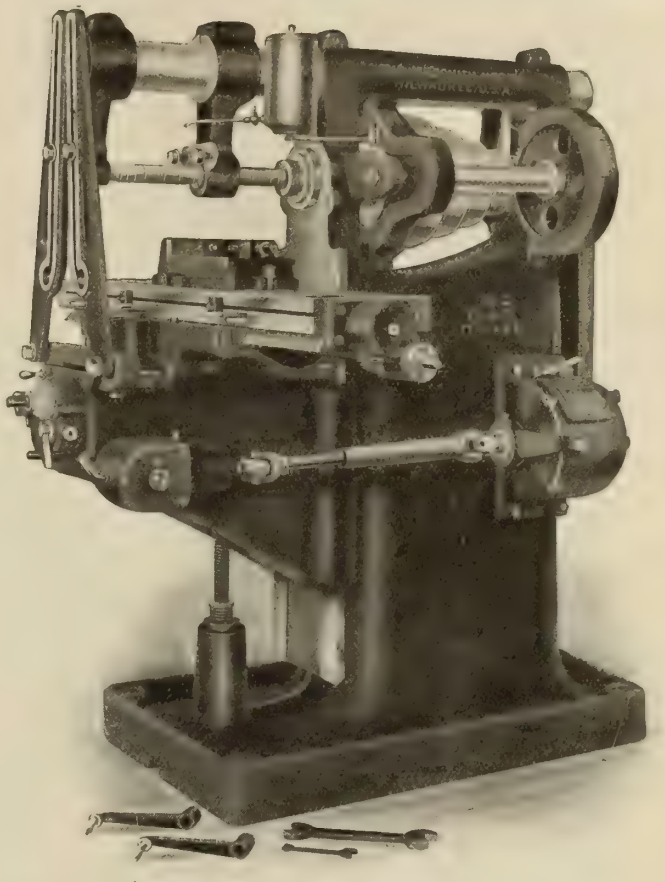
Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.

KEMPSMITH
Plain Millers



Powerful: Have new style strengthened countershaft; very liberal belt surface; large back-gear ratio; the high efficiency of the feed mechanism throughout delivers maximum relative power at point of cut.

Massive construction, especially at points of strain and wear.

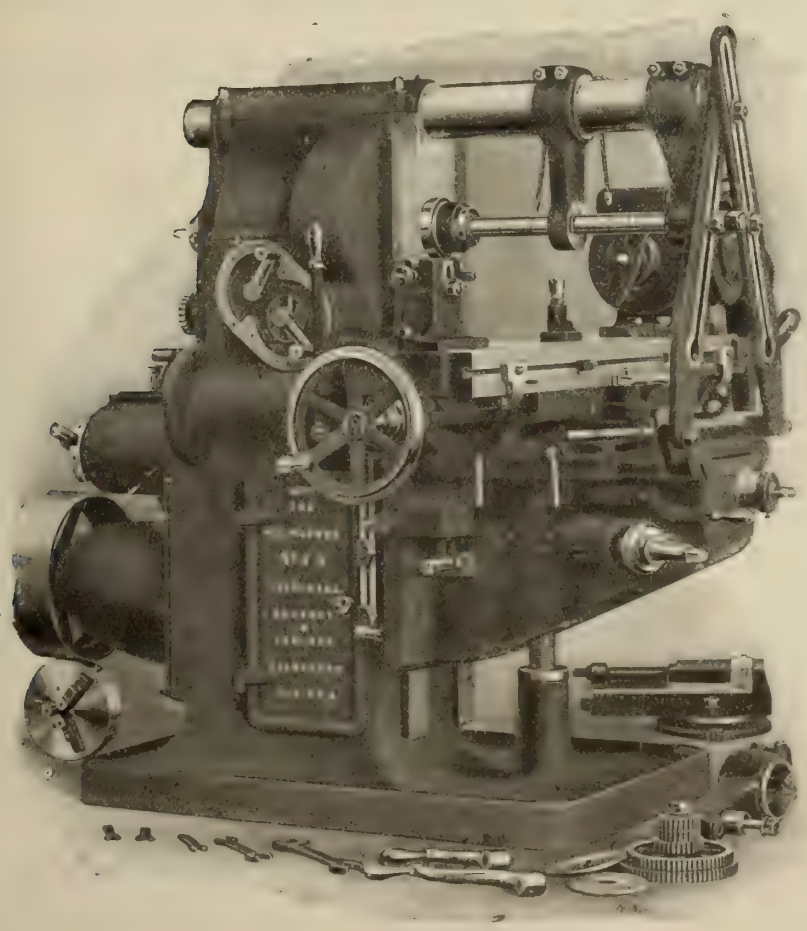
Simple, operative levers very few in number, concentrated for more convenient handling.

THEY ARE RELIABLE IN SEVERE MILLING.
WONDERFUL IN THEIR WORKING QUALITIES.

The Kempsmith Mfg. Co.

MILWAUKEE, WISCONSIN

Canadian Agents:
RUDEL-YEATES MACHINERY CO., MONTREAL



THE MILWAUKEE

No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

Let us send you more particulars.

Kearney & Trecker Co.

Manufacturers - Milwaukee, Wis.

Agents:
The A. R. Williams Mach'y Co., Toronto
Williams & Wilson - Montreal

It Means Economy to Install Modern Tool Company's MODERN PLAIN, UNIVERSAL and INTERNAL GRINDERS



THE MODERN INTERNAL GRINDER NO. 6

From the Engineer's Point of View, there is a manifest superiority about the mechanical design and workmanship of the Modern Machine Tools, three of which are mentioned above.

We give these grinders the same close-fitting precision that is shown in our smaller tools, and we strive to keep your confidence by a steady improvement in our facilities and a constant standard for our products—the best.

Modern Machine Tools are all guaranteed.

Write for copy of our booklet "MODERN."

Modern Tool Company

2nd and French Sts. - Erie, Pa., U.S.A.

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

Internal and Cutter Grinding

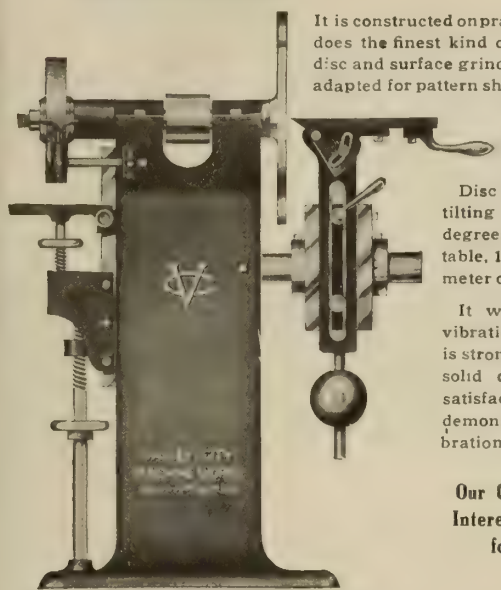
of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

No. 9 Disc and Surface Grinder

Here is the Machine That will Meet *Your* Requirements.



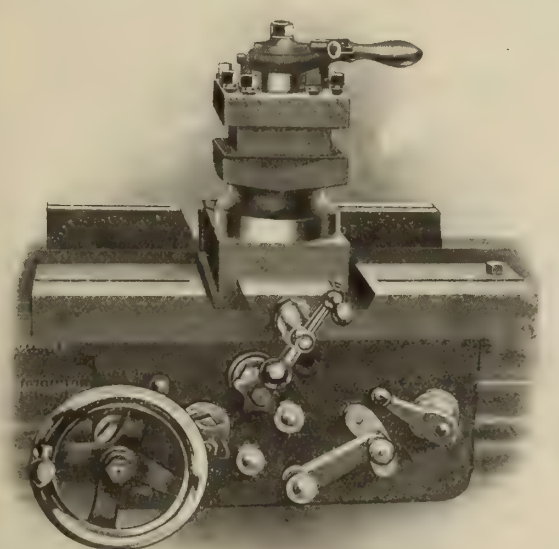
It is constructed on practical lines and does the finest kind of work. This disc and surface grinder is especially adapted for pattern shops die makers and all kinds of tool and surface grinding.

Disc side has table tilting from 0 to 43 degrees. Size of disc table, 10 x 10 in. Diameter of disc, 18 in.

It will solve your vibration problem. It is strongly built of one solid casting; and satisfactory tests have demonstrated that vibration is avoided.

Our Catalogue will Interest You. Write for it now.

Valley City Machine Works
20 Compau Street
GRAND RAPIDS MICHIGAN



We want to furnish you with one of these

Four Sided Tool Posts

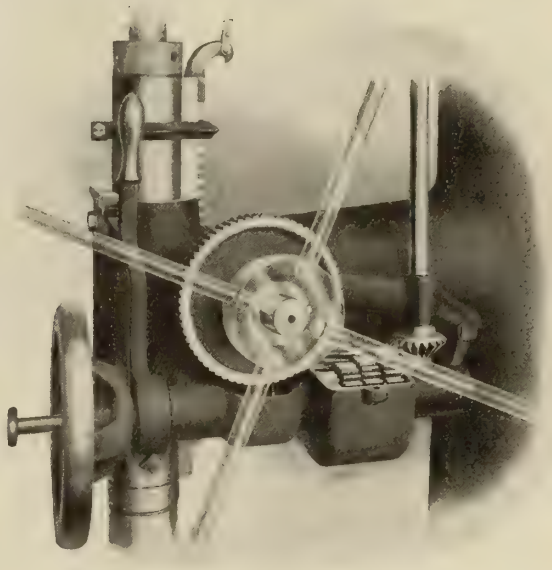
to go on your lathe, We fit them to any make of lathe so they operate by the regular cross feed screw. Don't stick to the old-fashioned single tool post, but insist on having your lathe equipped with a **Fay & Scott Patented Type.**

Send for Booklet.

FAY & SCOTT : Dexter, Maine

Canadian Agents—Williams & Wilson, Montreal, Que.; A. R. Williams Machinery Co., Toronto: A. R. Williams Machinery Co., Winnipeg; General Supply Co of Ottawa, Canada.

The Feed Mechanism of the Sibley Hi-Speed

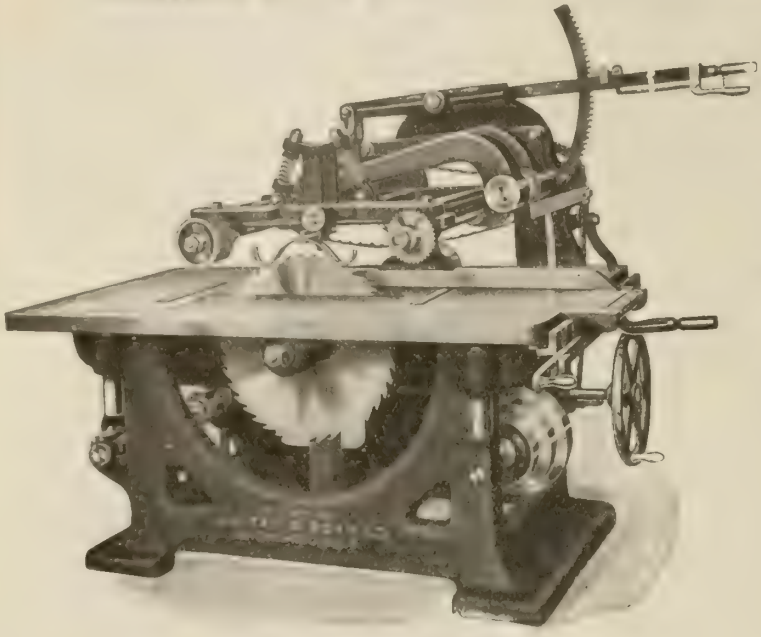


THE Feed Mechanism derives its power from the main drive shaft which directly rotates the spindle and is geared down in such generous ratios that an unusually powerful feed is obtained. The gear case is very compact and the gears are always in mesh. These, together with the steel worm, run in an oil bath. Four changes and a neutral position are made by moving a knob in the centre of the hand wheel. A positive adjustable collar on the graduated spindle sleeve trips a latch at the desired depth and the entire mechanism swings away from the worm gear on a large hinge pin. A special wear-resisting bronze alloy is used in the worm gear.

Sibley Machine Tool Company
Church Lane
South Bend, Ind., U.S.A.

OUR
No. 264 SELF-FEED RIP SAW

Embodies in its construction all features that are necessary for the satisfactory handling of light or heavy material.



No. 264 Self-Feed Rip Saw.

It is equally efficient in ripping SHORT or LONG Stock. Both the in-feeding and out-feeding roll may be adjusted close to the saw, permitting short stock to be fed without trouble.

The Feed Rolls may be instantly raised, converting it into a hand-feed machine when desired.

The table raises and lowers to accommodate different thicknesses of stock.

Capacity—Rips 4 in. thick with a 16 in. saw, and 8 in. with a 24in. blade. Takes 19in. between saw and fence.

WRITE FOR LARGE ILLUSTRATED CIRCULAR

J. A. Fay & Egan Co.

362-382 W. Front Street

CINCINNATI OHIO

A High-Grade Small Engine Lathe at Moderate Cost!

With or Without Quick Change Gear Device.—Three or Five Step Cone. You can use one in YOUR shop.



FREE from fussy attachments and mere talking points, the Von Wyck 15-inch engine lathe offers such a combination of convenience and economy that operators maintain, "It is unequalled by any lathe of its swing."

WHY buy a large size and pay a big price to get great strength and efficiency? Von Wyck design and construction are thoroughly high grade in every important detail and satisfactorily cover an unusual range of work.

VON WYCK

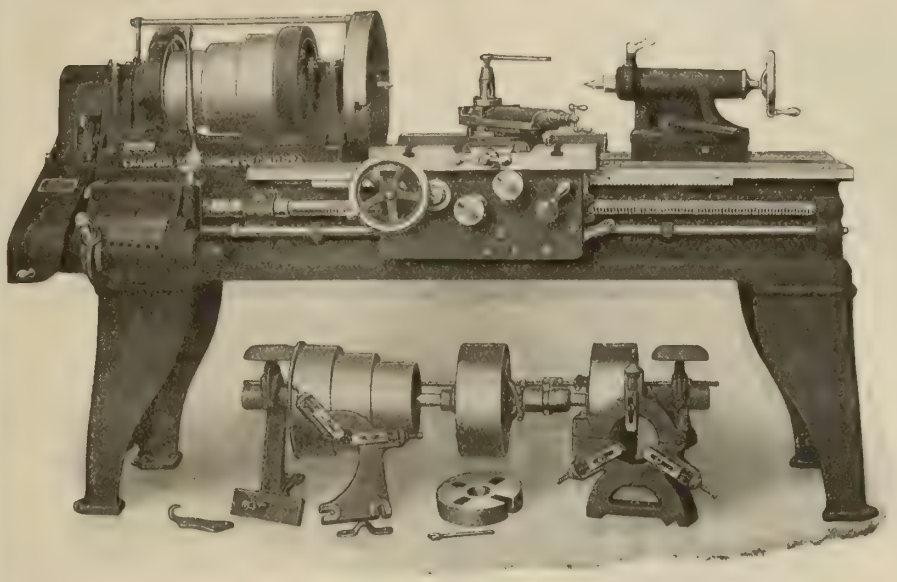
MACHINE TOOL COMPANY

Cincinnati, O., U.S.A.

Rudel-Yeates Machinery Co., Montreal

Canadian Agents

CHAMPION LATHES an incentive to increased output.



16-in. Quick Change and Double Back Gear Lathe.

We all know how the Machinist prefers the convenient Tool. It not only lessens his labors, but enables him to get at his work with greater dispatch and satisfaction.

The convenient form of Double Back Gear here shown for changing instantly from Low to High Gear or vice versa by simply shifting the vertical lever and without stopping the lathe or leaving his working position in front of the machine is a convenience which should not be overlooked in your next Lathe Order.

The **CHAMPION** Patented Positive Clutch Type Double Back Gear Lathe is the best.

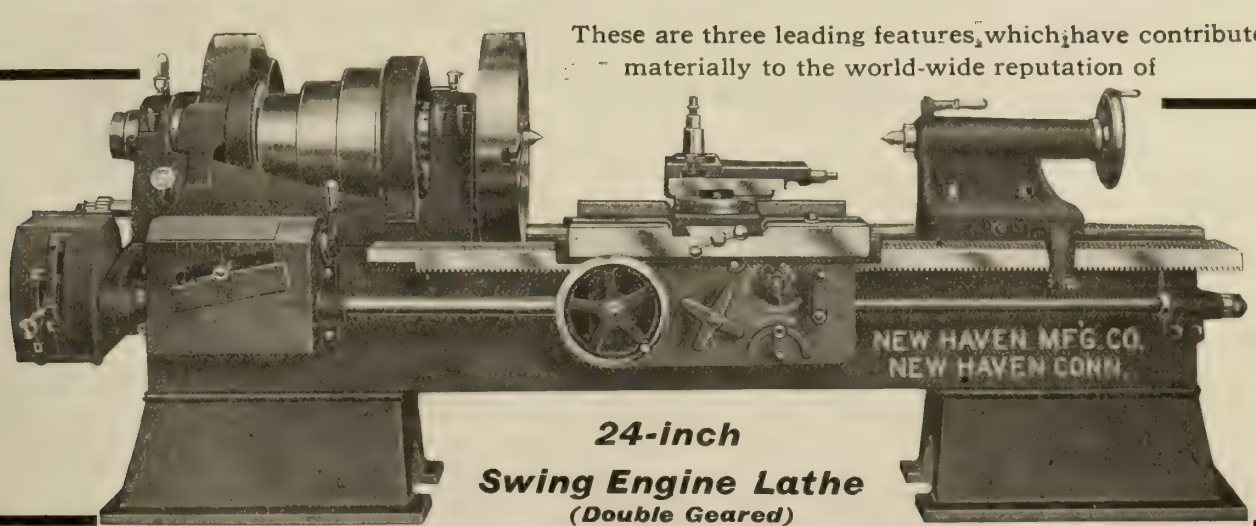
Read the Details in our Catalogue of 10-12-14-16 & 18-inch Lathes.

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.

ACCURACY — RELIABILITY — DURABILITY

These are three leading features which have contributed materially to the world-wide reputation of



24-inch
Swing Engine Lathe
(Double Geared)

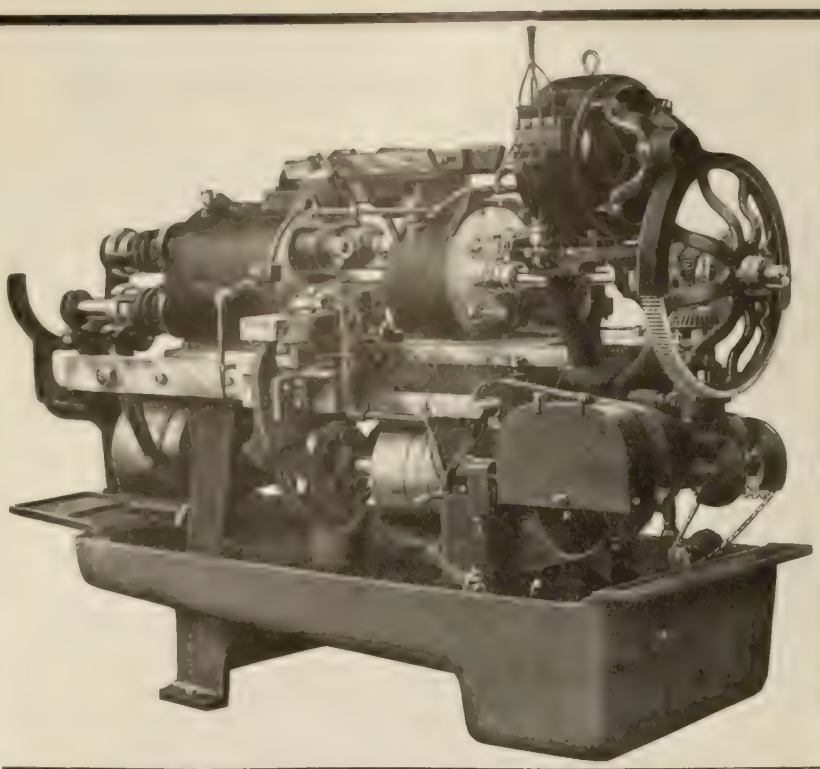
NEW HAVEN LATHES

Their great outstanding feature is their capacity for long, continuous and perfectly satisfactory service. New Haven Lathes are tested in every conceivable way to ensure accuracy, and are guaranteed unreservedly.

WRITE FOR DETAILED SPECIFICATIONS AND ILLUSTRATED CATALOGUE

New Haven Manufacturing Co.

NEW HAVEN, : : : : : : CONN., U.S.A.



The National Acme Mfg. Co.

Factories :: MONTREAL - CLEVELAND

Branch Offices: New York, 77 White St. Boston, 141 Milk St. Chicago, 549 Washington Blvd. Detroit, 122 Majestic Bldg. Montreal, St. Elizabeth St. and G.T.R. Atlanta, Candler Bldg.

General Foreign Representatives: Alfred H. Schutte, Cologne, Paris, Brussels, Liege, Milan, Madrid, Bilbao, Barcelona, Schuchardt & Schutte, Berlin, London, Vienna, Stockholm, St. Petersburg, Copenhagen, Budapest, Shanghai.

The Cost Per Piece On Your Small Parts

SHOULD BE THE LOWEST

This is the problem which we have been working on for years, and we have solved it. Wherever you find **Acme Automatic Multiple Spindle Screw Machines** you will find low costs, and the method is responsible.

There are four spindles carrying stock upon which as many as eight tools work at the same time. The Drive is Single Belt or Motor; the Control is One Lever; there are no reversals. The time for completing any piece is that required to perform the longest cut.

If you are not in a position to make the parts, send us your samples for quotations, or get our Catalogue on Standard Screws and Nuts. We guarantee quality, and the price is consistent with low costs.

The Machine or the Parts

ACME

Grinding, Polishing and Buffing Machinery

You will be wise to defer any purchase you are contemplating making in

SPEED LATHES

until you have examined our catalogue and compared our prices.

In perfection of design and construction our machines are unequalled and each machine is warranted to give highly satisfactory service in every respect.



WRITE TO-DAY FOR CATALOGUE AND DETAILS

J. G. Blount Company

Everett, - - - Mass., U.S.A

Simplicity of Adjustment

is a prominent feature of the

Russell

ANTI-FRICTION

Drill-Chuck



merely a turn of the wrist being sufficient to release or attach it.

The "Russell" 'grips like grim death,' is self-tightening, and is entirely automatic in its action. Ball-bearings practically eliminate friction, and it has interchangeable jaws, perfectly accurate.

The only chuck that will hold straight shank drills without slipping. **Write for Catalogue.**

Sole Distributing Agents for Canada

The General Supply Co. of Canada

Limited

Ottawa, - - - - Canada

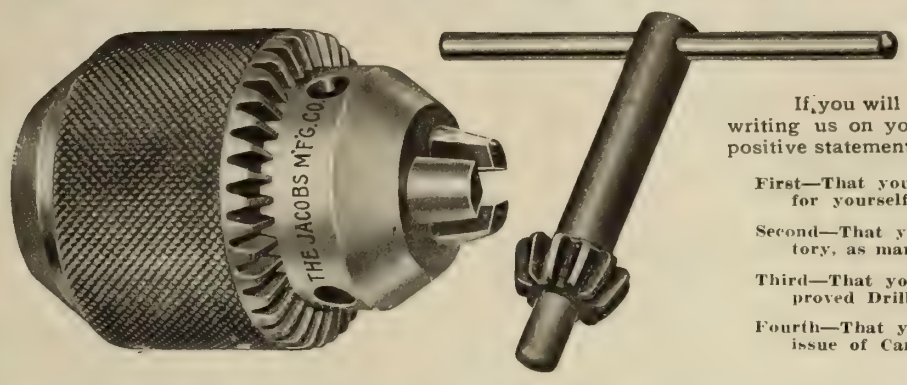
MADE IN 5 SIZES BY

Russell Anti-Friction Drill Chuck Co.

ELMIRA, N.Y.

The advertiser would like to know where you saw his advertisement—tell him.

"Even Exchange is no Robbery."



If you will send us your name and address, writing us on your business stationery, making positive statements as follows:—

First—That you are in the machine business for yourself;

Second—That you use in your shop, or factory, as many as four Drill Chucks;

Third—That you do not use the Jacobs Improved Drill Chuck;

Fourth—That you saw this offer in the May issue of Canadian Machinery;

we will, upon receipt of such information, send to your address, without cost to yourself, one of our No. 2 Drill Chucks, having 21/64 inch capacity. This offer is good only until June 1, 1911.

This is not a "Gold Brick" Offer

It means dollars and cents to you. We have sold more than 100,000 Jacobs Improved Drill Chucks. Of these, more than 48,000 were the same as the Chucks which we are offering you, and we never sold one of these Chucks to a consumer for less than $3.85.

Why do we make this offer? Because we know that when you learn the true value of the Jacobs Improved Drill Chuck, you will become one of our satisfied customers. A satisfied customer is of more value to us than a Drill Chuck, and as a Drill Chuck will be of more value to you than the letter you write, the transaction will be mutually profitable.

Our new thirty-four page illustrated catalogue, showing half-tone illustrations, actual size, of the ten different sizes and forms of the Jacobs Improved Drill Chuck, will be sent to you free upon request.

The Jacobs Manufacturing Company, Hartford, Conn.

POWER PUNCHING AND SHEARING MACHINERY

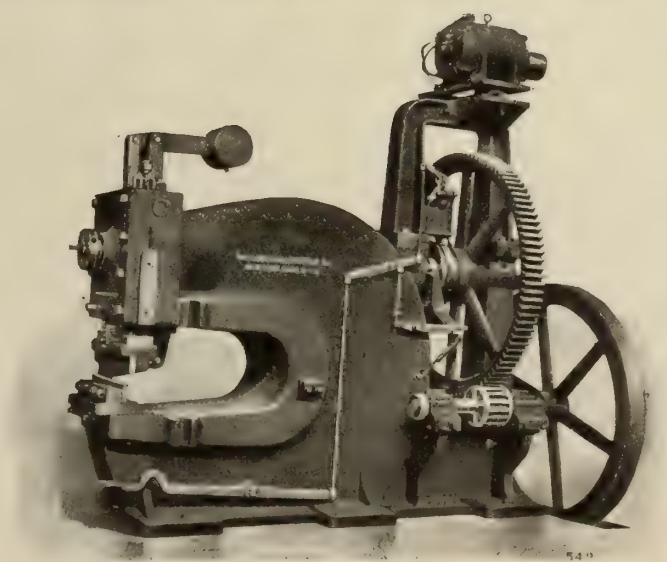
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications.



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

Tire Bending Rolls.

Bending and Forming Machines.

Drop and Helve Hammers, Etc., Etc.

Designed and Manufactured by

THE LONG & ALLSTATTER CO.

Hamilton, Ohio, U.S.A.

Save Space, Labor and Handling

by doing both drilling and tapping on a

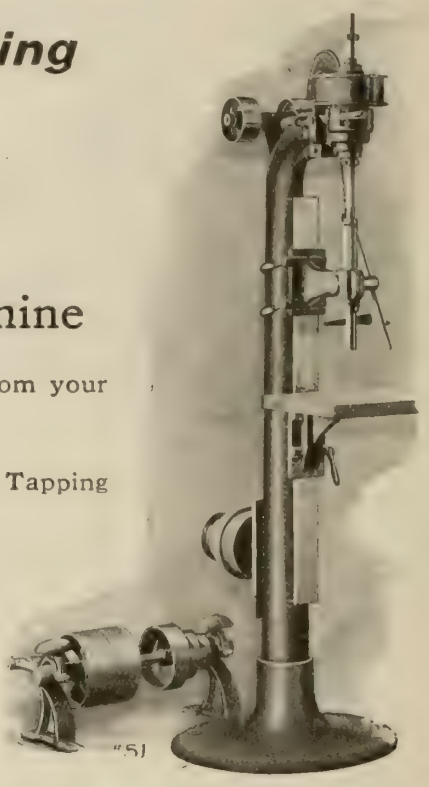
"BARR"

Combined Drilling and Tapping Machine

as well as separate machines. Why not obtain double service from your capital by installing a "BARR?"

You can buy power feed, lever feed and Combination Drilling and Tapping features in any combination, two to seven spindles to a machine.

WRITE FOR DETAILS TO-DAY.



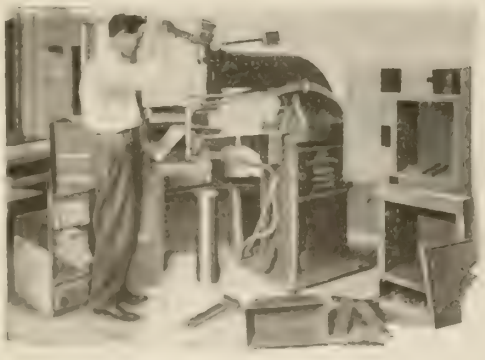
H. G. BARR

WORCESTER, - MASS., U.S.A.

WILLIAMS & WILSON, Montreal, - Agents for Eastern Canada

ABSOLUTELY FREE--The Sheet Metal Workers' Handbook

A NEW BOOK JUST OUT.



It tells how to fasten two pieces of Sheet Metal together without Soldering or Riveting.

No Holes to Punch. No Rivets to Set.

It tells about the "Electric Way" of spot welding: how it's made and why it's cheaper than riveting. Shows convincing proof that a spot weld is 60% stronger than a rivet—looks neater and is absolutely safe for the operator.

QUICK? Say---it's so quick that greased lightning is a canal boat for speed by the side of it.

This shows only one kind of machine illustrated in this book and some of the work done on it. It's a hand operated—stationary lever machine. They are made with swivelled lever handles—or can be furnished to be power driven or foot operated with depth of throat 14 in., 24 in., 30 in., 36 in., or 48 in., but the book tells all about this and more. It also gives a hint on butt welding machines. It's yours for the asking.

No Lease. No License. No Royalty.

The "Toledo" Electric Welder Co.

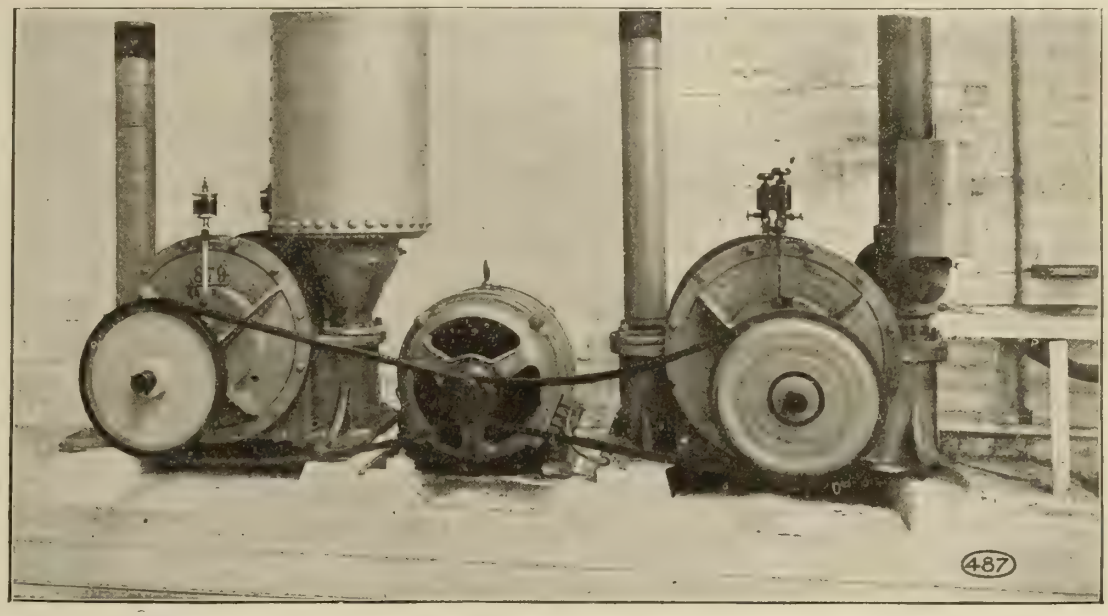
CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Renold Patent Silent Chain Drives

MANUFACTURED SOLELY BY HANS RENOLD, Ltd., MANCHESTER, ENG

Maintain an efficiency of 98.2 per cent., and compared with maximum efficiency of high grade belts, effect a continual saving of power.

Quiet and Smooth-Running



Not Affected by Heat or Dampness

A motor driving two blowers, in motion, one with air vessel, the other without The one to the right without air vessel is fitted with a spring cushion sprocket Note the smooth running

This chain consists of:

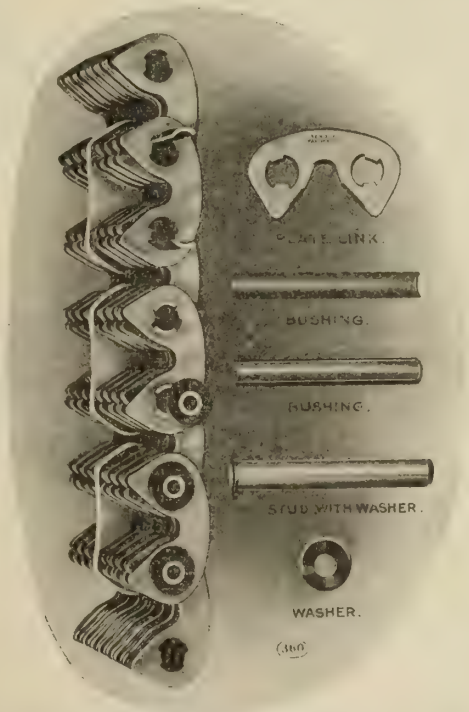
Plates with working angles ground true.

Hardened segmental bushings.

Hardened shouldered studs, which are free to rotate.

Washers.

Centre-Guiding Plates.



Showing Patent Bearings of the Renold Silent Chain and giving General Construction

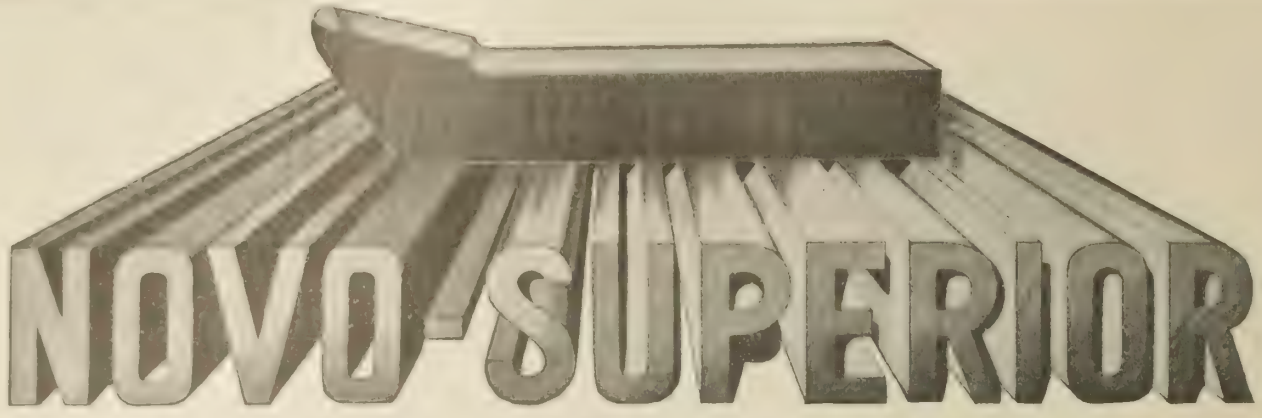
ABSOLUTELY RELIABLE

The friction comes on tempered and lubricated hard-steel surfaces, while the bearing surface is the maximum possible in chain construction. The pin revolving inside the bushings providing an even distribution of wear at each point and prevents stretch.

WRITE FOR CATALOGUE and particulars of drives we have now running in your neighborhood.

JONES & GLASSCO SOLE CANADIAN AGENTS MONTREAL

Don't fail to mention "Canadian Machinery" in writing to advertisers.



High Speed Steel Has a Solid Foundation In a Name That Means Something

Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND CONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL

MARINE ENGINES and PUMPS. SHOE MACHINERY A Specialty



BRASS and IRON CASTINGS. BOILERS and REPAIRS.

That we have exceptional facilities at our disposal for the manufacture of all kinds of Machinery—in addition to our business as Brass and Iron Founders, General Contractors and Shoe Machinery Engineers—has been amply proved this year. In the short space of five months, we built and installed all the Engines and Boilers of the new sister steamers "Levis" and "Lauzon," whose trial trips were a complete success. We make a specialty of all kinds of Marine Engine Work, and shall be glad to quote for first-rate products only.

SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

Wire of every description for Slugger and Standard Screw Machines.

The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director

LEVIS, Quebec

The advertiser would like to know where you saw his advertisement—tell him.



ACCURACY

To make Twist Drills that will do absolutely accurate work requires the greatest skill—years of experience and the most careful attention to each detail of manufacture.

To secure the greatest wearing quality requires the best of steel, tempered to exactly the correct degree of hardness. Not all Twist Drills attain these two essentials, but

"W & B-DIAMOND"

Twist Drills do and we ***guarantee*** them to be of ***highest quality*** and ***accurate to size.***

We make them from Carbon Steel and Vanadium High Speed Steel and carry the largest stock in Canada.

The "Hercules" High Speed Twist Drill shown on this page is one of our many types and is ***twisted*** while hot from Vanadium High Speed Steel.

Write for Catalog No. 74

W & B CO ***TRADE MARKS*** W&B

The WHITMAN & BARNES MFG. CO.

ST. CATHARINES, - ONTARIO

The Wright Wrench
certainly is
The Right Wrench



Simple, strong, practical and a wonderful time saver. Instantly adjusted to any sized nut by simply pressing with the thumb. Can be adjusted and used with one hand. **Stays put.** No spring or back-lash. Never slips or locks on a nut. Does more work in less time than any other wrench. Made in 6, 8, 10, 12, 15 and 18-inch sizes, and in Automobile pattern in 8 and 10-inch sizes.

Sample 10-inch wrench sent postpaid to any point in Canada on receipt of $1.00

John Millen & Son, Limited

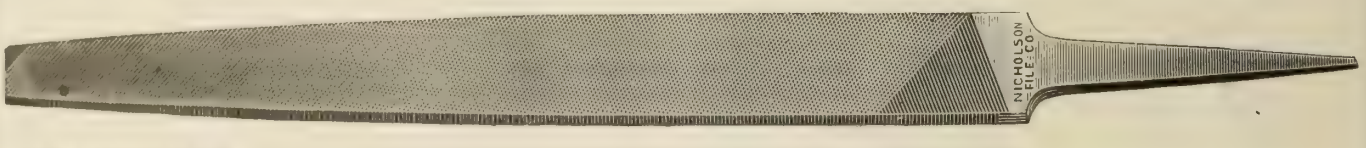
MONTREAL .:. TORONTO .:. WINNIPEG .:. VANCOUVER

Address all correspondence to 321 St. James St., Montreal

Certainty

THAT'S WHAT YOU FEEL WHEN
YOU ARE ORDERING OR USING

Nicholson - Made Files



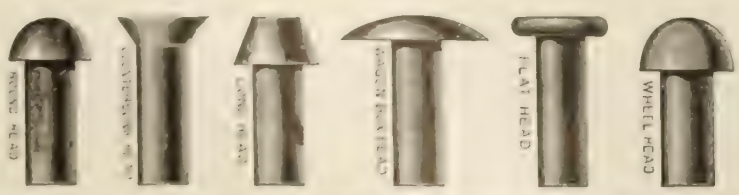
WHY?

NICHOLSON-MADE FILES NEVER DISAPPOINT. WHATEVER YOUR DEALER CLAIMS FOR THEM NICHOLSON-MADE FILES WILL PERFORM. THE QUALITY OF THE STEEL IS UNIFORM. THE CUT IS A MATTER OF MANY YEARS' SELECTIVE DEVELOPMENT.

Brands Made in Canada: American, Arcade, Great Western, Globe, Eagle, McLellan, Kearney & Foot, J. B. Smith

NICHOLSON FILE COMPANY

DOMINION WORKS PORT HOPE, ONTARIO

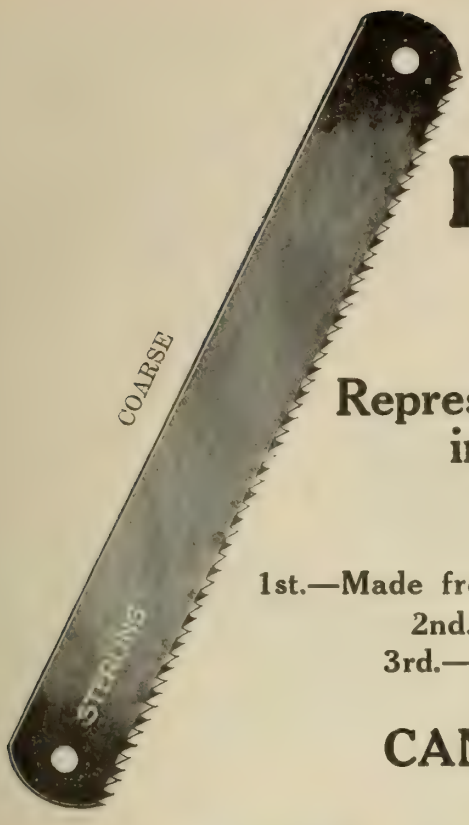


We manufacture Rivets of every description, ½ inch dia. and smaller.

PARMENTER & BULLOCH CO., LTD.

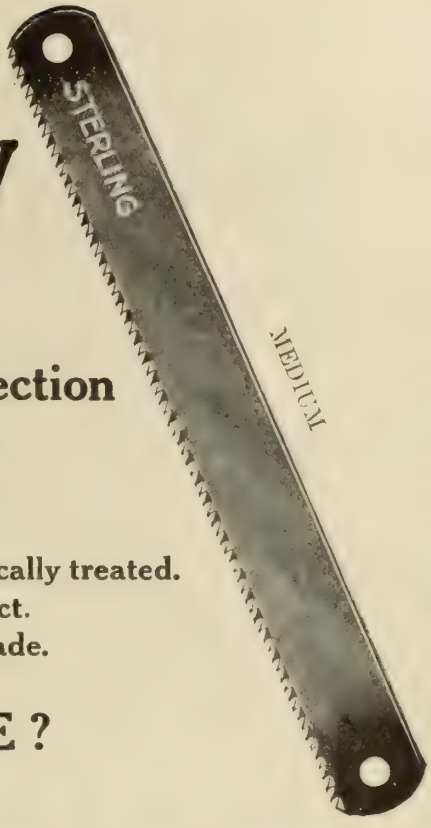
GANANOQUE, ONT.

The advertiser would like to adian Machinery" in writing to advertisers.



"STERLING"

HACK SAW BLADES



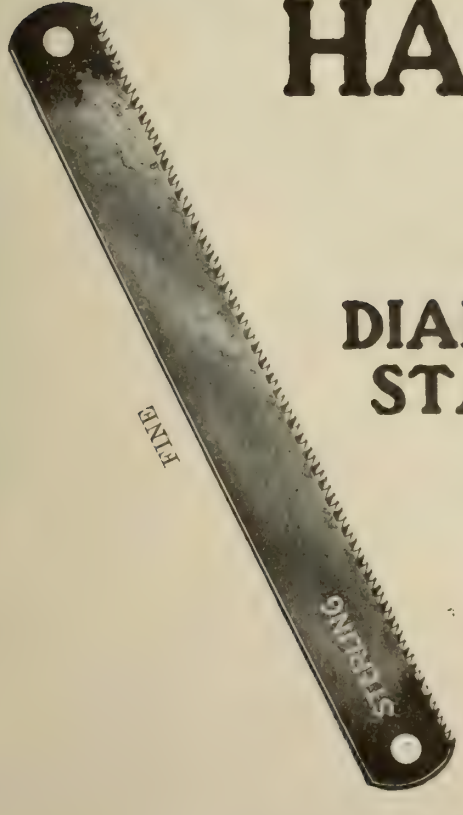
Represent the height of perfection in the hack saw world.

REASONS:

1st.—Made from the world's best steel, scientifically treated.
2nd.—Mechanical construction correct.
3rd.—Thorough inspection of every blade.

CAN YOU ASK MORE?

STERLING HACK SAWS



MANUFACTURED BY

DIAMOND SAW AND STAMPING WORKS

BUFFALO, N.Y., U.S.A.

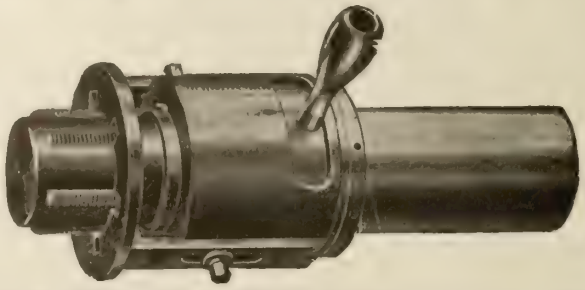
"Handled by first-class jobbers."



There are several tapping operations which you are now doing with solid taps on your Drill Press or Turret Lathe which

Geometric Collapsing Taps

WOULD DO THE WORK BETTER, AND IN HALF THE TIME.



GEOMETRIC COLLAPSING TAPS are as rigid as solid taps while cutting, but collapse their chasers automatically at the end of the cut, and there's no reversing required to back them out. We will be glad to tell you more about them if you will tell us your requirements.

The Geometric Tool Company

New Haven, Conn., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Quebec; A. R. Williams Machinery Co., Toronto, Ont.

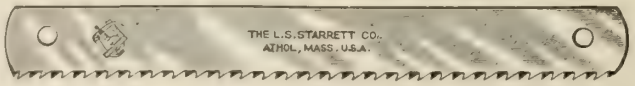
STARRETT TOOLS

ARE THE STANDARD

FOR ACCURACY, WORKMANSHIP, DESIGN AND FINISH



HACK SAWS



These blades are made of the finest grade of steel. The teeth are sharp, with square cutting points, and evenly set. They are tempered by our improved process, which leaves them hard and tough, so that they will not "shell off." They are too hard to file. The set of the teeth is just enough to insure a free, smooth and rapid cut, removing no more stock than is necessary.

LOOK FOR THIS MARK ***ON SAWS AND LABELS***

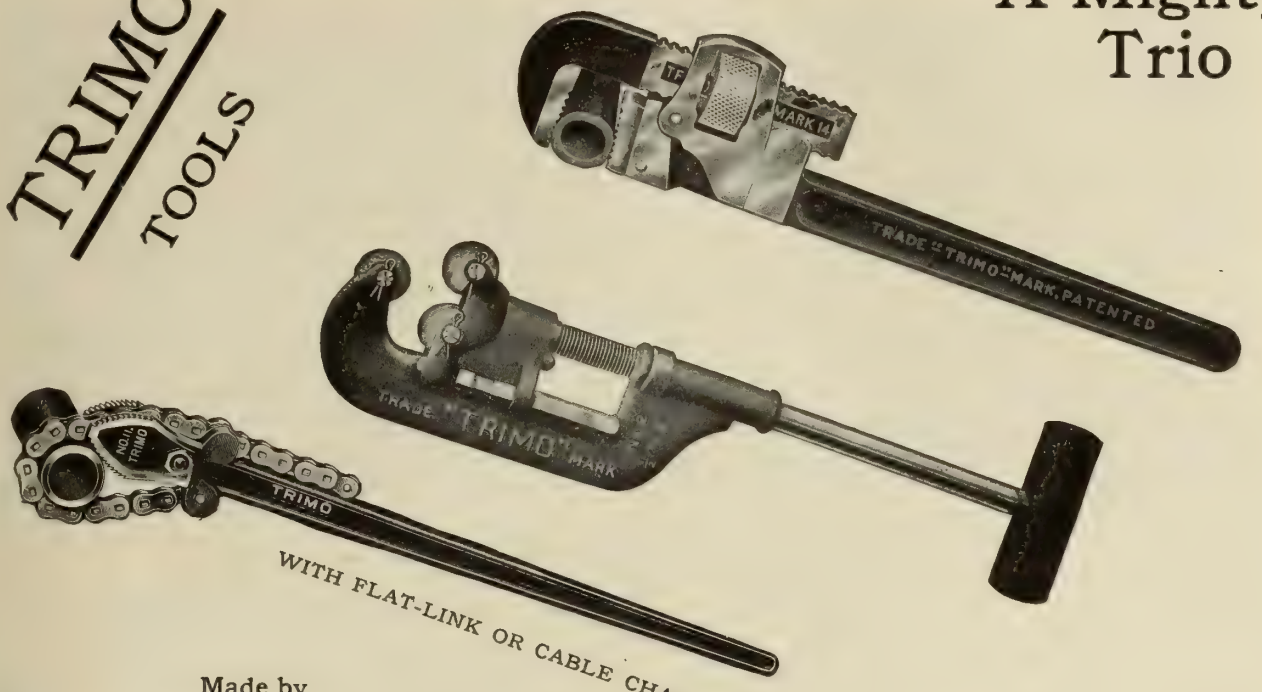
Send for free Catalogue No. 173 and Supplement, 192 pages of the best of Fine Mechanical Tools.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.

TRIMO TOOLS

A Mighty Trio



WITH FLAT-LINK OR CABLE CHAIN

Made by

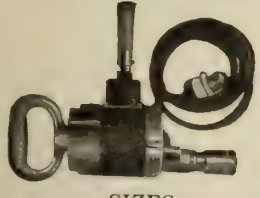
Trimont Mfg. Co.

Roxbury, Mass.

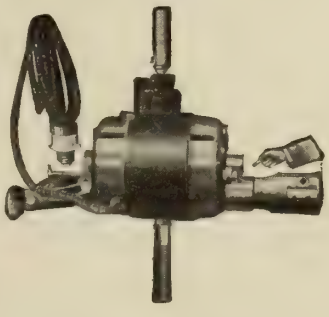
Send for Catalog No. 200

U. S. Electric Drills and Grinders

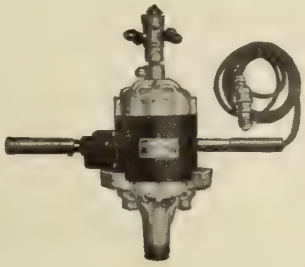
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



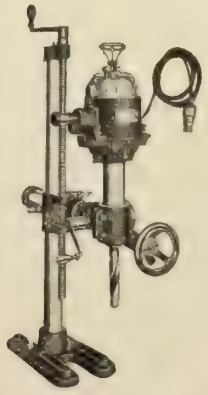
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - OHIO, U.S.A.

SCANDINAVIA BELTING

FEDERAL ENGINEERING & SUPPLIES LIMITED

TORONTO MONTREAL

A solid woven textile belt, impregnated to resist moisture.

We guarantee this belt for any Straight or Crossed Drives against any belting made.

It is equally good in WET or DRY places.

It is not made in plies and cannot come apart.

INQUIRIES SOLICITED

SAVINGS THAT COUNT come with GOODHUE BELTS

Savings Because They Stretch Less Than Ordinary Belts; There is Little Waste.

SAVINGS BECAUSE THEY WEAR WELL.
SAVINGS BECAUSE THEY ARE WATERPROOF.

MAKE A TEST IN YOUR POWER PLANT.

You will find them standing the strain well and giving splendid service when other less carefully made belts will have been discarded.

WRITE US FOR PARTICULARS.

J. L. GOODHUE & COMPANY, LIMITED.

DANVILLE, QUEBEC CANADA.

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

REPRESENTATIVES

L. F. McClernan
1243 Peoples Gas Bldg.
CHICAGO

L. F. McClernan
1417 Ford Bldg.
DETROIT

L. D. Rockwell
U.S. Express Bldg.
NEW YORK



McEWEN
High-Speed Automatic
ENGINES

Are built essentially for the economical production of electric light and power. Directly connected to dynamo, they cannot be equalled for smoothness of running, absolute reliability, and for the capacity to absorb overload without flinching. They are built in simple and compound units up to 700 H.P.

The McEwen Engine Catalogue will be sent on request.

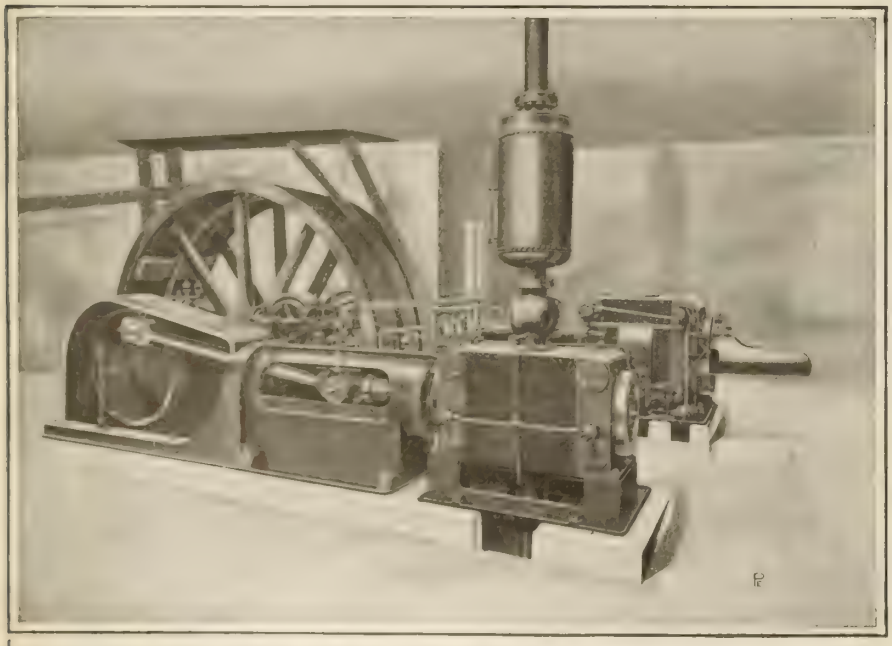
The Waterous Engine Works Co.
Brantford - Canada

Specifications

All parts are few and simple and are built to template, so that repairs can be quickly furnished. The bed is heavy and rigid, combining great strength with accessibility for all adjustments. Crosshead guides, main bearings, and face for cylinder attachment are machined in one operation. Connecting rod, of marine type, is slotted from the solid forging. Cylinder casting, of the best close-grained iron, is deep enough to permit reboring, and has front head cast solid. The flat side valve, double ported and frictionless, is held in place by a balancing pressure plate, slotted to correspond with the valve seat. This produces additional passage to the cylinder by providing double admission and exhaust edges. Relief valves are absolutely unnecessary. Crosshead shoes have a special eccentric bolt adjustment, which is simple, rapid, and perfectly accurate. The special feature of these engines is the guaranteed control by the Begthrup Governor. This, the first successful shaft governor built, permits instantaneous regulation without flinch when changing from full load to no load.

Guarantee

The engine shall not run one revolution slower when fully loaded than when running empty, and a reduction of boiler pressure from the greatest to that necessary to do the work, will not reduce the speed of the engine one revolution. Any engine failing to meet this guarantee becomes the property of the purchaser upon the payment of one dollar.



Cross Compound Goldie Corliss at Cosmos Cotton Co., Yarmouth, N.S. Rope Drive.

Reliability is the most important consideration in the selection of a Power Plant.

Manufacturers above everything else must have a steady day in and day out service.

The only way this can be obtained is by the installation of a HIGH GRADE STEAM ENGINE.

Goldie Corliss Steam Engines give a maximum of service all of the time.

Remember your **Exhaust Steam** does away with
HEATING BILLS

Ask for our Catalog and all Particulars

The Goldie & McCulloch Co., Limited

GALT, - - ONTARIO, - - CANADA.

WESTERN BRANCH
248 McDermott Ave., Winnipeg, Man.
MARITIME PROVINCES
13-15 Dock St., St. John, N.B.

QUEBEC AGENTS
Ross & Greig, 412 St. James St., Montreal, Que.
B. C. SELLING AGENTS
Robt. Hamilton & Co., Vancouver, B.C.

The advertiser would like to know where you saw his advertisement—tell him.

The John Inglis Company, Ltd.,

ENGINEERS and BOILER MAKERS

TANKS

OF ALL KINDS

CONDENSORS

AIR COMPRESSORS

SPECIAL MACHINERY

Our Representative will tell you all about the "INGLIS" Boilers.

WRITE US



Scotch Marine Boiler built for M. Beatty & Sons, Welland, Ont.

BOILERS

SCOTCH MARINE

FITZGIBBON

SCOTCH DRY BACK

RETURN TUBULAR

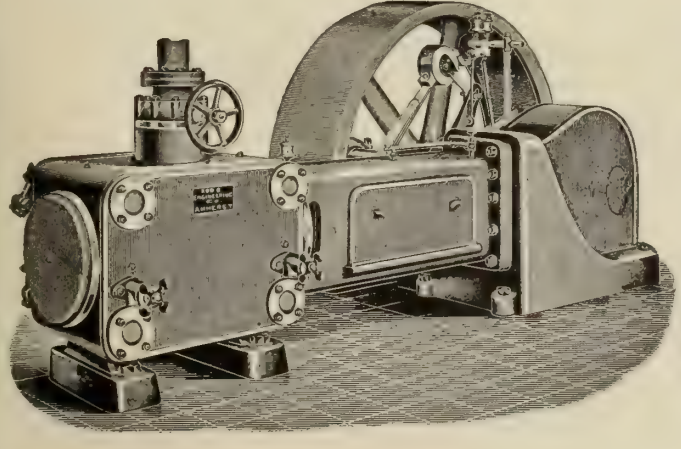
LOCOMOTIVE

VERTICAL SUBMERGED TUBE

WATER TUBE, VERTICAL and HORIZONTAL

14 Strachan Avenue, TORONTO, CANADA

Robb Corliss Engines



Have the Armstrong-Corliss valve gear, which will operate at a higher speed than the ordinary releasing gear.

This valve gear does not depend on springs or dash pots for closing, and runs without noise.

The wearing parts of the valve gear are enclosed in a casing and run in oil so that friction is reduced to a minimum.

Robb Engineering Co. LIMITED

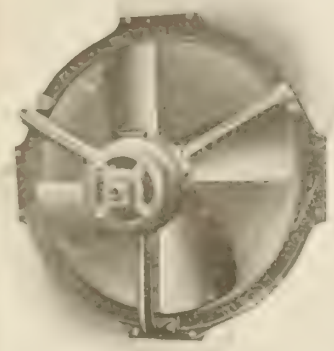
AMHERST, N.S.

DISTRICT OFFICES

Canadian Express Building, Montreal	R. W. Robb, Manager
Traders Bank Building, Toronto -	Wm. McKay, "
Union Bank Building, Winnipeg -	W. F. Porter, "
Grain Exchange Building, Calgary -	J. F. Porter, "

THE **CYCLONE**
ELECTRIC FAN

has been adopted by the **BRITISH GOVERNMENT** for the ventilation of the following buildings:



Houses of Parliament

Buckingham Palace

Natural History Museum

Law Courts, Patent Office and Post Office, etc., etc.

Highest Efficiency and best Workmanship Guaranteed.

ASK OUR AGENTS FOR CATALOGUE No. 129

MATTHEWS & YATES, LTD., SWINTON Manchester, Eng.

AGENTS FOR CANADA
BAIN & MITCHELL. Y.M.C.A. Building, Montreal
ANGLO-AMERICAN SUPPLY CO. Ltd., 311 Enderton, Bldg., Winnipeg

Let Us Know Your Pulley Requirements

We can equip your mill complete with the strongest yet, the lightest pulleys made, the

ONEIDA STEEL PULLEYS

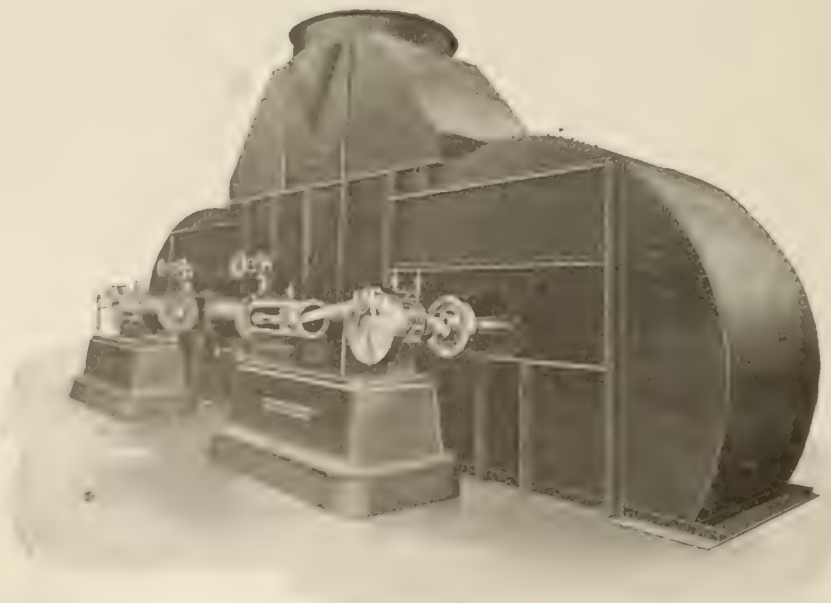
The ONEIDA is made in the greatest range of sizes of any steel pulley in the world. From 6 inch to 126 inch diameter, with 2 inch to 40 inch face, to fit any standard size shaft from 1 inch to 8½ inch.



We also manufacture special flange pulleys, elevator, head, tail and tripper pulleys, and all steel conveyor drums.

SEND FOR OUR CATALOGUE

Oneida Steel Pulley Co.
Oneida, N.Y.



Burn Cheap Fuel

With the Sheldon Mechanical Induced Draft System you can cut the cost of fuel in half, by utilizing a cheaper grade, or can secure better and almost smokeless combustion from the same grade of fuel that you are now using.

Send for Catalogue No. 14

SHELDONS LIMITED - GALT, ONTARIO

REMOVING THE APPENDIX



Would you have this operation performed by some doctor who offered to do it cheap or by an experienced successful specialist? We know the answer.

The same principle applies in many other directions. There has been a wonderful change in the intellectual broadening of operative Engineers and Mechanics. They are no longer satisfied with merely keeping the machinery in good running order. They start in at the coal pile and study the califoric power of fuels in thermal units, the firemen are put through a school of instructions, and they study economies and scientific problems in many other directions,

BUT How many Engineers and Mechanics figure on the loss from frictional resistance in transferring the power from the boiler to the points where it is needed?

More than half of the power is often absorbed in that way and yet many up-to-date men use or permit to be used the most ordinary grades of babbitts because of the slight initial saving in the cost price.

It Is Plain as an Open Book

that the value of a genuinely good and economical bearing metal is summed up in and expressed by a low co-efficient of friction.

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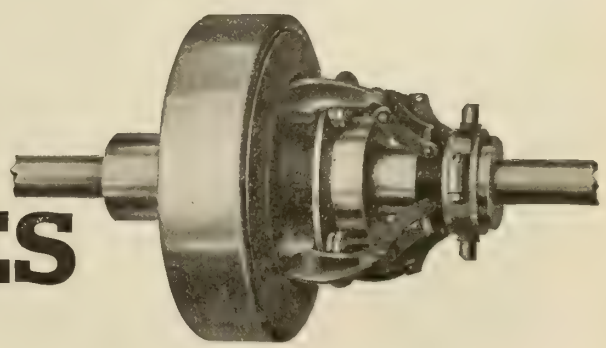
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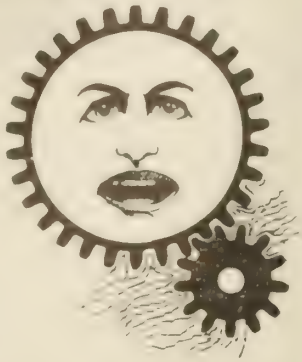


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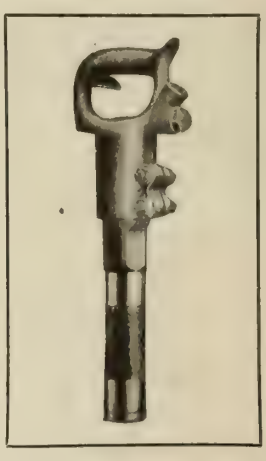
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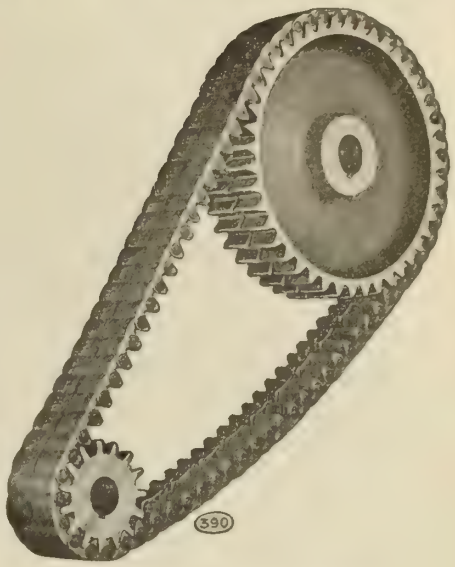
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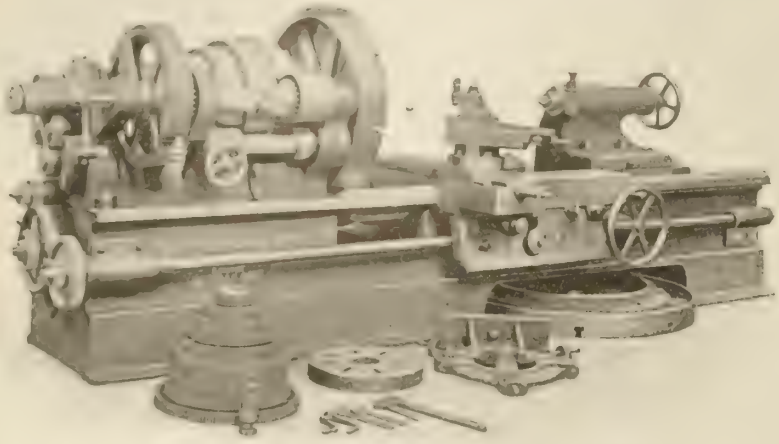
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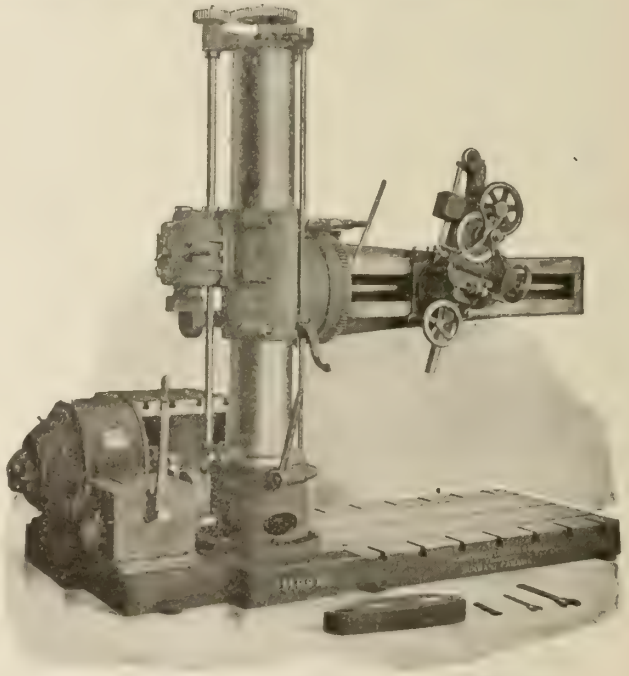
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Making Milling Cutters to Secure Greatest Efficiency*

By A. L. DeLeeuw

Present-day Practice Shows that Better Results Can be had From Milling Cutters by Increasing the Tooth Space and Depth. They Have a Number of Points in Their Favor Among Which are Less Consumption of Power, a Greater Amount of Work Done for One Sharpening and a Greater Number of Possible Sharpenings per Cutter. A Change in the Form of Chip Breaker Made it Possible to Use Cutters With Chip Breakers for Finishing, as Well as for Roughing. It was Found Advisable to Use a Special Kind of Key, Here Described, for Heavy Work. Finally, This Paper Describes a New Style of Face Mill and What is Called a Helical Mill.

THE amount of metal which a machine tool can remove in a given time is limited by the strains caused by the cut. Great hardness of the material to be cut, or a dull tool, will severely strain the machine and so reduce the section of the chip, even if the machine

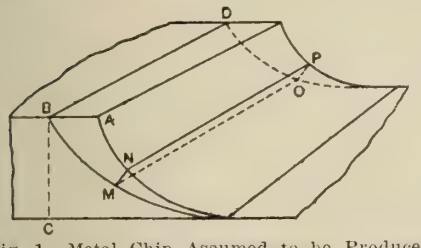


Fig. 1.—Metal Chip Assumed to be Produced by Milling Cutter Without distortion.

is rigidly constructed and well supplied with driving power. It is therefore of the greatest importance to analyze carefully all the conditions which cause heavy strains so that they may be obviated or reduced to the lowest possible limit.

This limitation of the cutting capacity occurs in all metal cutting machines, although to a varying extent. While it is possible to increase the driving power of most machines ad libitum, and almost any amount of metal can be put into machine elements to give them rigidity, there are certain classes of machines where practical considerations limit such increase of power and strength. This is especially true in machines where the main elements have to be adjusted and handled with great frequency. The knee-and-column type of milling machine owes its success, to a large extent, to the ease and rapidity with which it can be manipulated and it is doubtful if it will ever be possible to increase the dimensions of the parts much beyond the present sizes, without losing the benefits of the peculiar construction of this type of machine. In order to increase the capacity of this type of milling machine, it becomes necessary to reduce the strains set up by the cut and there are only two elements which can be modified to accomplish this result. These are the hardness of the metal to be cut and the cutting qualities of the milling cutter. As it is impossible to control the first of these the only avenue left for improvement leads in the direction of the milling cutter.

The action of the ordinary milling cutter is not a true cutting action, as it is commonly understood. By a true cutting action is meant the driving of a wedge-shaped tool between the work and the chip and although this definition is not based on a generally accepted meaning of the term it is believed that it expresses fairly well what most mechanics understand by cutting. Practically all milling cutters have their teeth radial and this, of course, excludes the possibility of driving a wedge between chip and work. The tooth compresses the metal until it produces a strain great

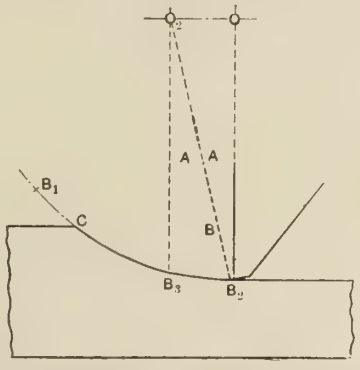


Fig. 2.—Diagram Illustrating Action of Milling Cutter.

enough to cause a plane of cleavage at some angle with the direction of the cutter. It then begins to compress a new piece, push it off, and so on. This at least seems to be the action of the cutter, judging by the form of the chips. These chips are in the form of needles or small bars.

The chip taken by a milling cutter varies very materially from those taken by a lathe or planer tool. These latter tools make chips of uniform section, whereas the section of a milling chip increases from zero to a maximum.

Fig. 1 shows a milling chip as it would appear, if no compression or distortion took place. The proportions are very much exaggerated, so as to bring its typical shape clearer into view. The width AB at the top is equal to the feed per tooth. The height BC is the depth of cut. The length BD is the width of cut. The section MNOP, shown half way on the chip, is a normal section and a measure of the amount of work which was done at the time the cutter passed the point M.

Fig. 2 shows the action of a milling cutter, with centre O, when the cutter is rotating and the work is feeding at the same time. The tooth AB sweeps through the path BC. When the point B has reached the position B_1 a new tooth starts cutting. By this time O has advanced to position O_2, and the new tooth A_2 B_2 is not yet in a vertical position, when the point B_2 touches the work, When the cutter revolves, this point B_2 must penetrate into the work and compress the metal of the work. The result will be spring in the arbor. When this spring has assumed certain proportions, the blade or tooth begins to remove a chip. This may be assumed to take place in the position B_2, the tooth simply gliding over the work from B_2 to B_3. This action must necessarily be very harmful to the cutter, and, it was believed that this perhaps more than any other action of the cutter, caused its dulling. It would be especially severe with light cuts, as a relatively small amount of spring would allow the point B_2 to travel through a large arc. It would be quite possible that a tooth should fail entirely to take a chip, and that the succeeding tooth would take a chip of double the amount.

This peculiar action of the milling cutter is inherent in its construction and

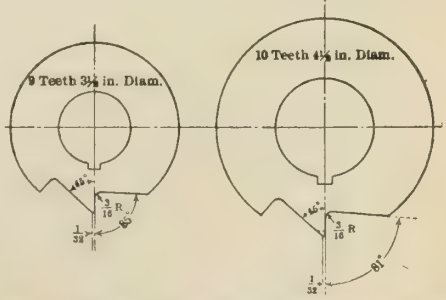


Fig. 3.—Form of Spiral Milling Cutters Now Used by the Cincinnati Milling Machine Co.

cannot be avoided. The question then is how to minimize these harmful results.

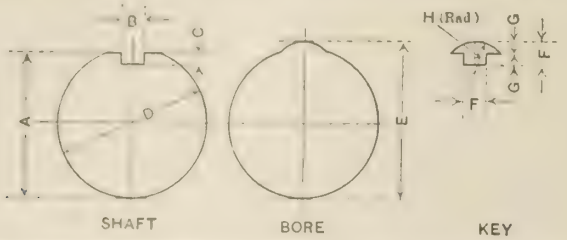
Another feature, which limits the ability of a milling cutter to remove metal,

* Read before the A. S. M. E., New York.

is the proportion between the chip to be removed and the amount of space between two adjoining teeth. Such a limitation does not exist with lathe or planer tools, where the chips have unlimited space in which to flow off.

That this proportion between chip and chip space actually [illegible] a cutting

ters and special gangs. The standard diameters are 3½ in. and 4½ in. The 3½ diameter cutters are made with nine and the 4½ diameter cutters with ten teeth which corresponds to a spacing of about 1¼ in. The point of the tooth has a land of 1/32 in., and the back of the tooth forms an angle of 15 deg. with the



A	B	C	D	E	F	G	H
0.971672	3/16	3/4	1	1.05179	3/16	3/4	13/64
1.09779	3/16	3/4	1 1/16	1.11592	3/16	3/4	13/64
1.28875	1/4	3/8	1 1/4	1.3125	3/16	3/32	1/4
1.4543	1/4	1/8	1 1/2	1.5793	1/4	1/8	21/64
1.7111	1/4	1/8	1 3/4	1.8361	1/4	1/8	21/64
1.94734	3/16	3/8	2	2.10359	3/16	3/32	13/32

Fig. 4. Shape and Dimensions of Keys Used for Milling Cutter Arbors.

[illegible] radial line. The chip space is approximately four times as great as in the usual standard cutter of the present time and is formed with a 3-16 in. radius at the bottom.

Proper Sized Arbors.

Though not directly connected with the foregoing, attention should be called to the fact that the present practice calls for arbors which are too small. In the cutters shown here, the 3½ in. cutter is made with 1½ in. and 1¼ in. arbor, and the 4½ in. cutter with 1¼ in. and 2 in. arbor.

It is often very difficult to remove cutters from an arbor after they have done heavy work. It is frequently necessary in such cases to press the arbor out of the cutters. This sticking of the cutter is caused by the burring up of the key and often the keyway in the arbor. For this reason, keys are used for gangs of cutters as shown in Fig. 4. A flat is milled on the arbor, and the keyway milled central with this flat. The flat portion of the key presses against the flat part of the arbor, and this effectively prevents burring. Cutters which are held on the arbor with such a key can always be very readily removed, even after prolonged and hard work. The keys are made out of a piece of round stock, grooved at both sides and then sawed apart.

It was found that for roughing on the ordinary work in the shop a cutter with the wider spaced teeth would remain sharp for a longer period, notwithstanding that feeds had been increased. The system of the Cincinnati Milling Machine Co. requires all gangs and cutters to be re-sharpened after a lot of pieces have been milled. It used to be necessary, at least on the larger lots, to re-sharpen the gang once and sometimes twice for the one lot, or, if this was not deemed advisable, the feed had to be reduced for at least part of the pieces, in order to make the cutter last during the entire lot. In all cases where the wide-spaced cutters were used, the entire lot was run through without re-sharpening the cutter or reducing the feed; and it should be kept in mind that this feed was from 25 to 100 per cent. greater than previously used. There is no case on record where the cutter or gang was dull at the end of the lot, so that our observations as to the endurance of the cutters are incomplete. However, it is perfectly safe to say, that in all cases under observation the cutter maintained its sharpness longer; that in a great many cases double the amount of work could be done without re-sharpening, and that there is good reason to believe an even greater gain than this was obtained.

A further advantage is, that as these cutters have approximately only half the number of teeth of what is now considered a standard cutter, the time for re-sharpening is only half as much.

It was pointed out that the ratio of pitch to depth is practically the same as in the present standard cutter, so that the depth of tooth is practically doubled and this cutter can be sharpened much more frequently than the present standard cutter. Consequently the life of the cutter has been much increased, probably more than doubled.

A glance at the drawing of these cutters gives the impression that the teeth are weak and the writer has watched this feature with great care. The cutters themselves, however, do not give this impression; on the contrary, they look stout and well proportioned. They have been subjected to the heaviest class of work and many times were purposely abused in order to find their weak points; yet there is no case on record that any of them have broken although they have been used for more than two years and all breakages of cutters are carefully noted. On the other hand, breakages of the old cutters are not at all infrequent.

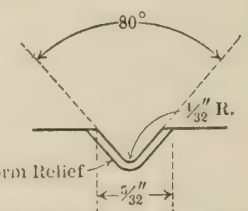


Fig. 5. Chip Breaker, Double Size.

Though these cutters are capable of removing metal more rapidly than the older type of cutter there are many cases where this feature cannot be taken advantage of, as, for instance, where

light work is to be done or a small amount of stock to be removed. In such cases, however, the metal is removed with less power and consequently with less strain on the machine and the life of the machine is lengthened without limiting its output.

Smooth Cutting.

With the wide spacing of the teeth it may seem that there would be cause for apprehension as to the action of the feed. It seems as if the feed would be liable to act with jerks. This, however, is not the case. On the contrary, the feed is smoother and there is less of a jerk when the cutter first strikes the work, probably because there is less spring in the arbor and less tendency for the cutter to ride over the work, as will be explained later in connection with the description of cutters.

In connection with this it is interesting to note that when cast iron is milled by these wide-spaced cutters, it appears to be very soft and when the same piece is milled by an old style cutter, it appears to be much harder. When using wide-spaced cutter, there is a notable absence of jerking, chattering and of the peculiar singing noise which is so often noticed on milling machines.

There is, of course, a difference in the hardness of different pieces of cast iron, and many recommendations as to the proper feeds and speeds for milling cast-iron work, made by the writer for his company, were looked at askance. The impression seemed to prevail that feeds and speeds which were possible on American iron, were out of the question on European iron, (especially English and German); and again, that feeds and speeds proper for western American iron were not suitable for eastern iron. To test the truth of the matter, a number of bars of cast iron were obtained from different foundries in America, England, France and Germany. These bars covered a great many mixtures and makes, and the difference between English and American, or German and American iron, or between eastern American and western iron, was found to be no greater than that between different specimens of western American iron. Even German Spiegeleisen, famous for its hardness, cut just as freely as soft western iron, and required but little more power. However, it did require more clearance, wide spaces, and a low speed.

These wide-spaced cutters were originally intended for roughing operations only, but the very satisfactory finish obtained when roughing led to the use of the cutters for finishing also. If there is any difference at all in the finish produced, the advantage is on the side of the wide-spaced cutter. The fact that this wide-spaced cutter will cut a greater number of pieces without dulling means, of course, that the average finish of an entire lot is better.

Chip Breakers.

It is generally believed that for finishing alone a milling cutter should be used without chip breakers, the effect of the chip breaker being to scratch the surface. To overcome this trouble, chip breakers are made as shown in Fig. 5 with clearance at both corners. This prevents the tearing up of metal with result that a cutter with these chip breakers produces as good a finish as one without chip breakers.

It should be pointed out that this form of chip breaker has an advantage also for roughing cuts. The point of the

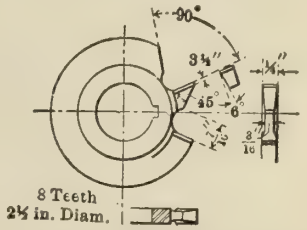


Fig. 8. Details of New Type of Side Mills.

cutter, where the unrelieved side of the chip breaker drags over the work, is the first point to give out. Making the chip breaker with clearance on both edges prolongs, therefore, the life of the cutter.

One of the great advantages of this form of chip breaker is, that one gang can be used for both roughing and finishing. A great many, if not most milling operations, call for two chuckings, one for roughing, and one for finishing. This will be found to be necessary wherever much metal is to be re-

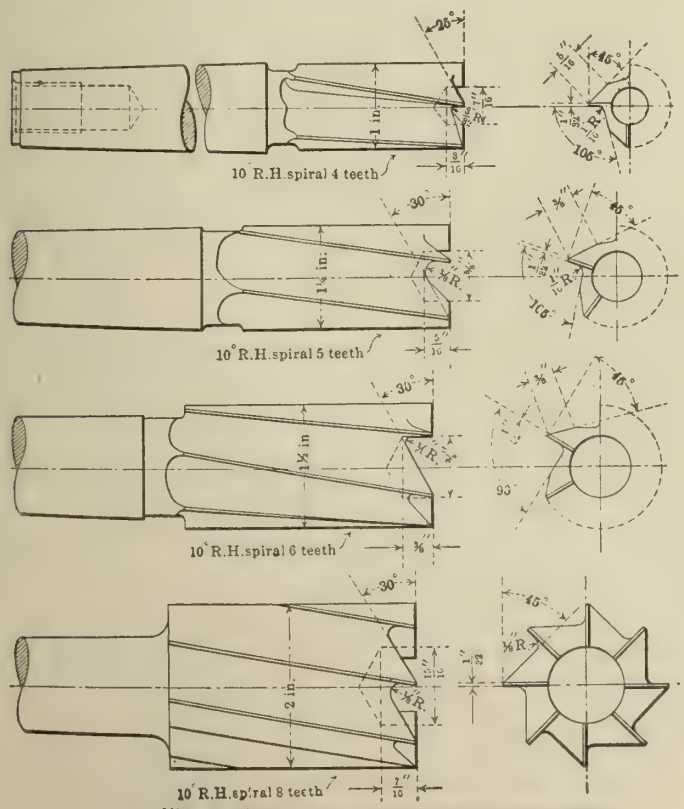


Fig. 6—New Type of Taper Shank End Mills.

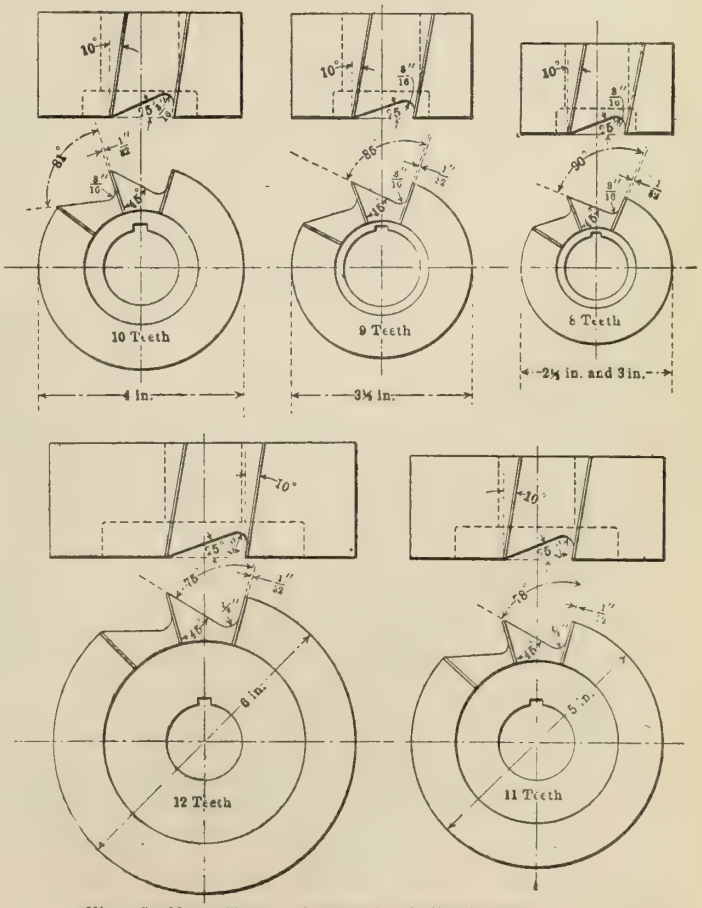


Fig. 7—New Type of Spiral Shell Cutters.

moved, on account of distortion, caused by the cut, the heavy clamping required, heating, spring of arbor or fixture and the unbalanced condition of the work after the scale has been removed on the side. In order to do the roughing as rapidly as possible chip breakers are required; and in order to get proper finish, it has heretofore been necessary that the finishing gang be without chip breakers. It paid, therefore, to have two gangs whenever the number of pieces to be milled was sufficiently large, but this involved considerable extra expense for cutters. The new form of chip breaker, however, permits using one gang for both finishing and roughing.

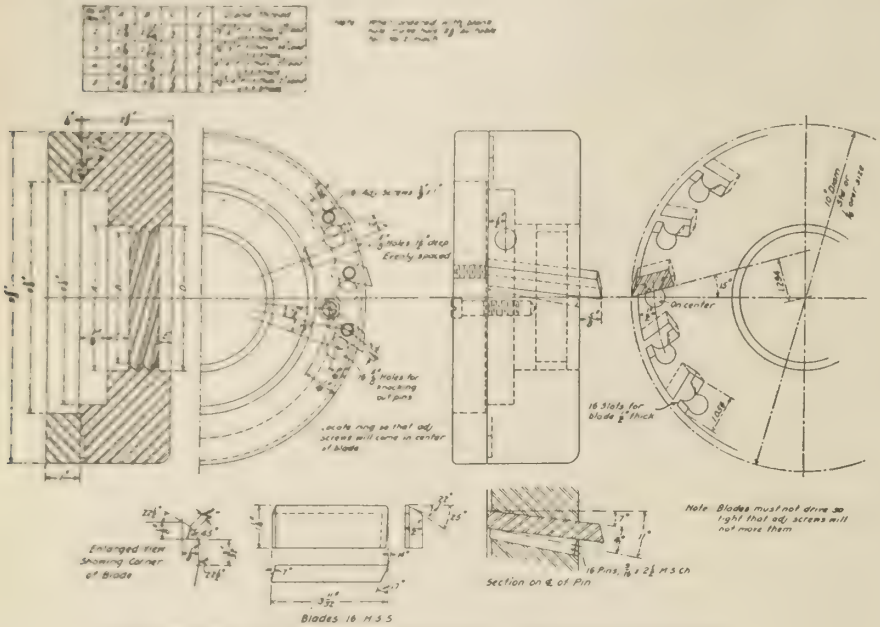


Fig. 10—Ten-inch Blade Face Mill for High Power Machines.

It is a common belief that better finish can be obtained with teeth closely spaced, but experience with the wide-spaced cutter shows that there is no ground for this belief. The grade of finish may be expressed by the distance between successive marks on the work. These marks are revolution marks and not tooth marks. It is practically impossible to avoid these revolution marks. They are caused by the cutter not being exactly round or quite concentric with the hole, by the hole not being of exactly the same size as the arbor, by the arbor not being round, by the straight part of the arbor not being concentric with the taper shank, by the taper shank not being round, or of the same taper exactly as the taper hole in the spindle, by this taper hole being out of line with the spindle, by looseness between the spindle and its bearings, etc. Each of these items is very small in any good milling machine; yet the accumulation of these little errors is sufficient to cause a mark and this mark needs to have a depth of only a fraction of a thousandth of an inch to be very plainly visible. As these marks are caused by conditions which return once for every revolution of the cutter, it is plain that the spacing of the teeth can have no effect on the distance between them, and, therefore, on the grade of finish.

To test this still further, two cutters of the same size exactly were placed side by side on an arbor. The cutters were ground together so as to be sure they were of equal diameter and they were ground on the arbor so as to be sure that the error would appear simultaneously for both cutters. A block of cast iron was finish-milled with these cutters in such a way that each cutter would sweep half the width of the block. The same number of marks appeared on both sides of the block, and these marks were exactly in line with each other, as might have been expected. The grade of finishing was the same for both sides. It was neglected to mark the two sides of the casting to show which cutter was operating. After this test, all of the teeth but one of one of the two cutters were ground lower, so as to be out of action entirely, leaving only one tooth of the one cutter operative. Another cut like the first one was taken over the same block, and again the finish appeared the same on both sides. There was a difference of opinion between different observers as to which side was cut by the single tooth. By close observation, however, a difference could be detected when light fell on the work in a certain direction, under which conditions one side showed more gloss than the other. Straightness, flatness and smoothness to the touch was exactly the same for both sides, notwithstanding that one cutter had one tooth only and the other fourteen teeth. Though it is not recommended here to use cutters with one tooth only for finishing, the foregoing test showed plainly that there is no merit in fine spacing. Attention is again called to the fact, that even though the finish on a single piece might be better with more teeth in action, the average finish for an entire lot of pieces is better with less teeth.

End Mills.

Fig 6 shows the end mills which are now considered standard by the Cincinnati Milling Machine Co., and which fill practically all requirements. They are made in sizes of 1 in., 1¼ in., 1½ in. and 2 in. in diameter, the smallest with four, and the largest with eight teeth It will be noticed that in order to preserve the strength of the teeth it is necessary to mill the back of the teeth of the three smaller sizes with two faces. A number of tests have been made with these cutters, but no comparative tests as to power consumption. Their action is remarkably free. This was clearly demonstrated by the following experiment: A 2 in. taper shank end-mill milled a slot 1 1-16 in. deep in a solid block of cast iron at a rate of 6 in. per min. The block was clamped to the table of the milling machine and the knee was fed upward. Under these conditions the chips did not free themselves from the cutter but were carried around and ground up. The cutter was cutting over half its circumference. These two conditions combined make the task for the milling cutter about as difficult as imaginable. There was, however, no sign of choking and the power consumption was not higher than it would have been with a spiral mill under ordinary canditions. The same cutter would remove from the end of the casting a section 1½ in. wide and 1½ in. deep. Under those conditions, the chips were rolled up in pieces much like the chips obtained from a broad planer tool, when taking a finishing cut. This cut was taken with a feed of 11 in. per minute. Another similar cut, but 1 in. and 1⅛ in. in section was taken with a feed of 33 in. per minute. Similar though much lighter cuts were taken with ordinary end mills, and in the same piece of cast iron. Again the cast iron seemed to be very hard, and became glossy when cut with an ordinary cutter, but appeared to be soft when cut with the wide-spaced cutter.

Fig. 7 shows the shell end mills of the wide-spaced type, which are now considered standard for their use by the Cincinnati Milling Machine Co. Figs. 8 and 9 show the side mills.

Face mills have also undergone a gradual evolution and they are now used by the company in catalogues, though not made by them for the use of customers, as shown in Fig. 10. Fig. 11 shows a cutter of a design now generally considered to be standard. In this latter design, the blades are spaced 1 in. apart, or approximately so; they are

set radial, and have no means to keep them from pushing back except the regular holding means. The wide-spaced faced mill, on the other hand, has the blades spaced 2 in. apart. They are set at an angle of 15 deg. with the radial line, and are backed by a backing ring with a set screw for each blade. These set screws allow the blade to be adjusted, besides forming a stop against upward movement under pressure. A face mill may be considered as a planing tool moving in a circular path. The cutting edge, therefore, is axial and not radial. To set the blades at an angle with the axis does not produce rake. The wide-spaced face mill shown here has rake, because the blades are set at an angle with the radial line.

It will be noticed that the blades are set at an angle with the axis. It will further be noticed, in the enlarged view of the blades, showing the rounded corners, that the corners are not provided with a round, but rather with three faces, which together approximate a curve. It is to offset the effect of this round that the angle with the axis is introduced.

However accurately a milling machine may be built, the spindle is not exactly at right angles with the table. The amount of variation exists. Besides, this variation is liable to become greater when the machine wears. The result is, that when feeding in one direction the leading teeth of the cutter dig deeper into the work, leaving the other side of the cutter entirely clear, but when feeding in the opposite directian the opposite takes place, which makes the teeth drag over the work. In order to provide the teeth with clearance, the back end of the tooth is ground away at an angle of three to five degrees.

It will further be noticed, that there is a land of 3-16 in. only where the blade is straight. It is the excess of width of the cutting blades which is liable to cause chatter. Strange as it may seem, this chatter is more pronounced with a light than with a heavy cut. It is not meant that there is actually chatter, but merely that when there is a tendency to chatter, the tendency is greater on a lighter cut. The cause is that the tooth does not enter the work but tries to ride over it. When the cutter has been lifted sufficiently, the pressure becomes great enough to make the blades enter. The next blade meets the same difficulty about entering, is lifted again, and so on. This action causes a series of radial chatter marks and is very much worse with wide blades than with narrow ones; and again very much worse with a large number of blades than with a few. A 3-16 in. land proved to be an acceptable compromise, as a wider land would quickly dull the cutter, even if it did not make a chatter mark, while a narrower land would have the tendency to produce a scratchy finish.

Helical Cutter.

In Fig. 12 is shown details of a helical cutter. These cutters consist of a cylindrical body, with two or three screw threads wound around them, the threads being of a section clearly indicated in the engraving. The helix is wound around the body with an angle of 69 deg. with the axis. The diameter is $3\frac{1}{2}$ in., and the lead of the helix $4\frac{1}{4}$ in. They are made in two styles, either single, or as interlocking right and left hand cutters. They are made with a rake of 15 deg. and clearance of 5 deg. when used for steel, and with a rake of 8 deg. and clearance of 7 deg. when used for cast iron. Their most distinguishing feature is, that they push the chip off in the direction of the axis of the cutter, or at right angles to the feed. The power consumption is extremely low for steel, but does not show up so favorably for cast iron. A roughing cut in steel requires only about one-third the power of an old-style spiral mill. Another distinguishing feature is, that this cutter does not make revolution marks but tooth marks. As a result, a much coarser feed can be used for finishing. A cutter with three teeth will allow of a finish three times as fast as an ordinary spiral mill. Still another feature of this cutter is the entire absence of spring in the arbor when cutting steel. It is possible to take a finishing cut over a piece of steel, then return the work under the cutter and let the cutter revolve any length of time without producing a mark.

It was originally thought that a single cutter of this description would do well for finishing, but not for roughing, on account of the excessive end pressure on the spindle, and the interlocking cutter was made to obviate this end pressure. However, it was found that this end pressure, though perceptible, was no disturbing element. Cuts which required 80 amperes with the interlocking cutter, required 85 amperes with the single cutter. In order to see if continued use of the single cutter would cause increasing friction at the spindle end, a great number of cuts were taken in as rapid succession as it was possible to adjust the machine for the next cut.

The fact that there is no spring in the arbor makes it possible to use the milling machine without braces in a great many cases where they would otherwise be needed.

It was first believed that these cutters would work best at a high speed; but it was found that this was not the case. They produce the best results when run at the same number of revolutions as the ordinary spiral mill.

The writer believes that the remarkably low-power consumption is due to what might be called "virtual rake,"

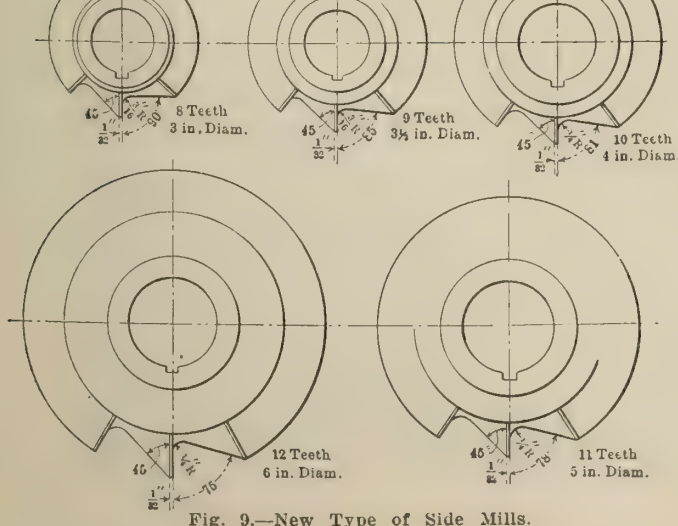


Fig. 9.—New Type of Side Mills.

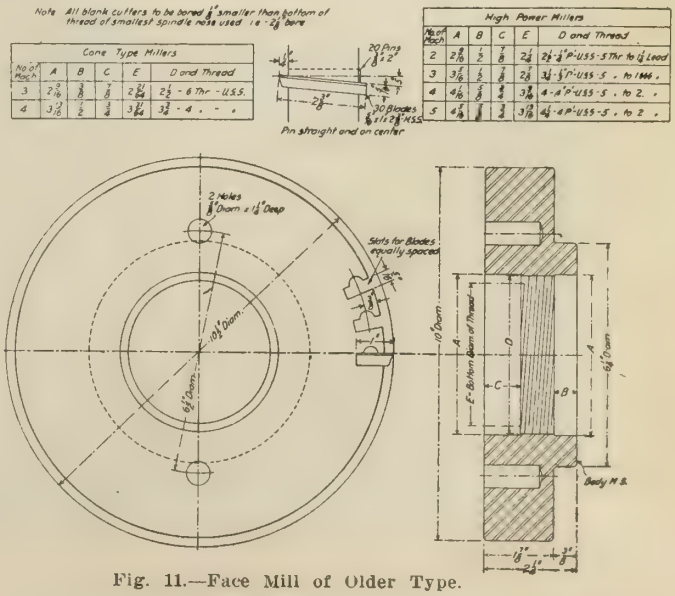


Fig. 11.—Face Mill of Older Type.

which is an angle depending on the angle of rake, and on the angle the thread or tooth makes with the axis. This virtual rake becomes a small angle when the actual rake is small. This is the case with the cutter as used for steel where the actual rake is 5 deg. Where, however, the angle of rake approaches 90 deg., the influence of the helix becomes very much less pronounced; and, if the actual rake were 90 deg. the influence of the spirality would be zero, in other words, the virtual would equal the actual rake. This may explain why the saving in power consumption is not so pronounced when cutting cast iron. It is believed that this saving of power would be equally great with cast iron as with steel, if the same virtual rake could be obtained, and this supposition was borne out by a few tests made on cast iron with a helical cutter ground for steel.

Another reason which suggests itself to the writer as to why the helical cutter shows less saving in power on cast iron than on steel, is the result of a series of tests made on cast iron and steel with spiral mills with and without rake, the rake being in all cases 9 deg. These cutters showed improved efficiency for steel and cast iron, but much more for the first than for the latter. A cutting tool must detach the chip from the work, bend the chip and at least partially break it up. When cutting steel, the radius of curvature of the chip becomes greater with increased rake and the extent to which the chip is broken up becomes less. Cast iron will stand much less bending before breaking, so that, even with increased rake, the chip is still broken up as before, and no saving in power can be effected in this part of the process.

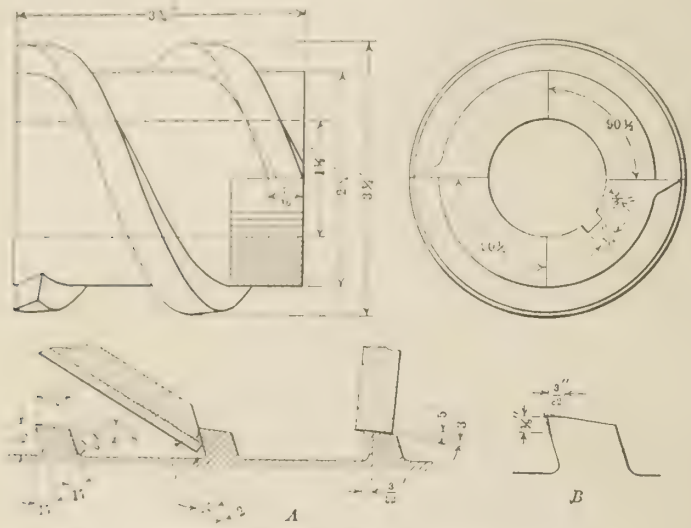


Fig. 12. Details of New Type of Helical Cutter.

REBORING CYLINDER.

By G. D. Keith

The Hall Engineering Works, Montreal, recently rebored a low pressure cylinder of 15 in. diameter and 18 in. stroke at the Dominion Textile Company's (Merchants' Branch) Cotton mills, Montreal. A portable boring gear, the property of the Hall Engineering Works was used, it being shown in operation in the accompanying illustration.

Steam was shut off the engine at 7 p.m. Thursday. The cylinder cover was removed and the piston and piston rod taken out. The boring gear was then placed in position, as shown, and reboring was commenced on the following morning. Three cuts were taken out of the cylinder, increasing its diameter $\frac{3}{4}$ in. The cylinder was finished and a new piston fitted, all coupled up, and a steam trial taken at 3.30 p.m. the following Sunday when everything worked satisfactorily. This work was therefore completed between Thursday at 7 p.m. to Sunday at 3.30 p.m.



Reboring Cylinder, Hall Engineering Works, Montreal.

EXTENSION DRILL MADE OF PIPE.

A serviceable extension drill may be made from a section of brass or iron pipe in the following manner: Take a piece of pipe, the internal diameter of which is the same as the diameter of the hole to be drilled. With a cross-peen hammer make two dents opposite each other about one and one-half inches from the end of the pipe. Into this end drive the twist drill first, grinding the end flat. A tap may also be driven in this fashion successfully.

TO MAKE BRAZED JOINT.

If occasion should arise when it is desirable to make a good clean brazed joint, the metal should be carefully cleaned, heated to a bright red, and then covered with the flux of the following formula: One pound of boric acid, four ounces of pulverized chlorate of potash, and three ounces of carbonate of iron.

A modern grinding wheel used on a modern machine by an operator with a good knowledge of grinding is just as surely a milling cutter as if it were made of steel. Its cutting surface consists of millions of small, sharp cutting teeth and each tool that comes in contact with the work cuts off a chip in the same manner as the tooth of a milling cutter.

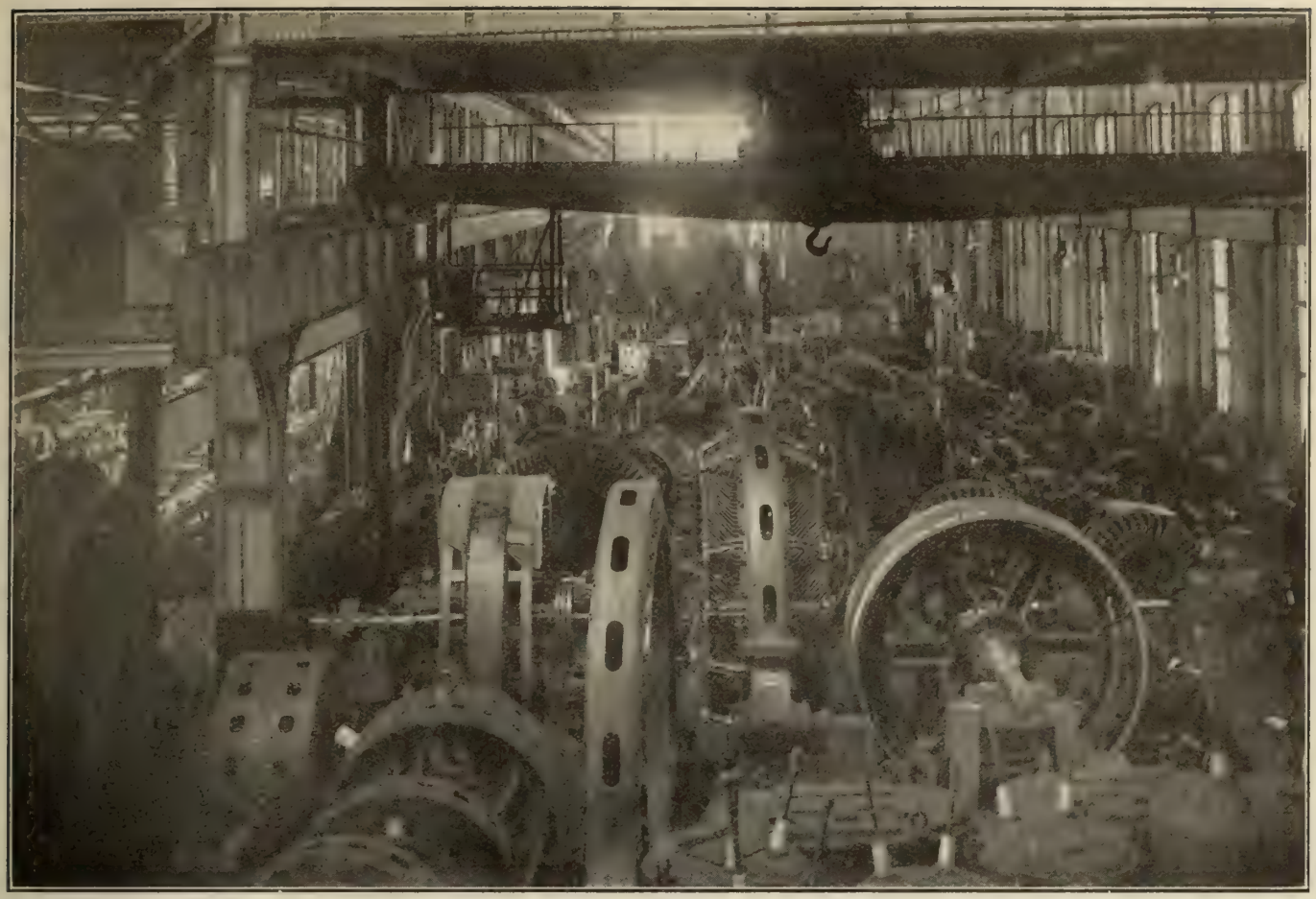


Fig. 3—The interior of one of the shops of the Canadian Westinhouse Co., Hamilton, taken April, 1911. The large amount of work under construction gives an idea of Canada's industrial expansion.

Enlarged Works of Canadian Westinghouse Co., Hamilton

An Interior View of One of the Canadian Westinghouse Shops Gives an Idea of the Enormous Amount of Work Under Construction by the Canadian Electrical Companies, and Also of Canada's Industrial Development. The Reason for Enlarging the Works is Therefore Obvious.

IN Fig 1 is shown the plant of the Canadian Westinghouse, Hamilton, as it will appear when the additions are completed. The works are conveniently located beside the main line of the G.T. R., sidings running therefrom to the various buildings for the receipt of material and shipment of product, while on another side of the plant, connection is made with the C.P.R.

The buildings are of the most modern approved type of fire proof construction, being of brick, reinforced concrete and steel. Fig. 1 shows the brake plant at the extreme right; the main buildings in the centre of the plan are devoted to the manufacture of electrical apparatus; and those on the extreme right consisting of pattern shops and foundry supply the needs of the brake and electrical departments in both brass and iron castings.

Building Plans.

In laying out the manufacturing buildings, two cardinal points were kept in view:—Each department might be capable of extension, and that the progress



Fig. 2—A 10,000 k.w. generator built by the Canadian Westinghouse Co., Hamilton, for the Canadian Niagara Power Co.

of material from the raw to the completed state, should, as far as possible, be in a continuous direction. This purpose, and the carrying on of operations with dispatch is facilitated by traveling cranes and an industrial railway.

Recent Additions.

The Canadian Westinghouse Co., to keep pace with the demand for electrical machinery in Canada, have found it necessary from time to time, to make extensions to their plant, the most recent of these, included an added space of 11,580 sq. ft. of storage, and 14,000 sq. ft. manufacturing capacity, besides increasing the area of the testing and shipping departments.

The foundry building will be more than doubled in size, which also means additional cupolas, core ovens and improved facilities for the handling of of foundry material, adding a floor space of 22,800 sq. ft.

The same plan of design and fire proof construction as first used, has been followed in all the additions, the only variation being that heavier steel work has been found necessary to serve increased crane carrying capacity, on account of the greater size of the units now being turned out.

The large interior scene, Fig. 3, is an interesting view of one of the machine shop aisles, with apparatus in various stages of construction. Fig. 2 shows the stator and bedplate of one of the Westinghouse type of 10,000 k.w. generators.

High-powered men like high powered engines do their work without making any noise.

APPLYING SCIENTIFIC KNOWLEDGE.

One of the common faults of some educated men is that they make little or no application of the scientific facts learned in school to the everyday problems of life. Perhaps it is because they are literal-minded, the principles having for them only the applications mentioned in the book. For instance, two young men, both graduates of the same high school, some years after graduation got into an argument on whether the weight of a block of wood floating in a pail of water is added to the weightof the pail and water or not. Experiment, of course, showed that it is, whereupon the one who was worsted quoted the Archimedean law to the effect that a floating body displaces its weight of the liquid, and was inclined to doubt the soundness of the old Greek's dictum after making the test. The fact that the mere displacement of a liquid does not alter its weight had never before been made plain to him, and not until a pail brimming over was tested did he grasp the full significance of the law.—Machinery.

A man who signs himself as W. Keppel White is taking collections, renewal and new subscriptions, for the MacLean publications in the Maritime Provinces, without any authority. The assistance of any subscriber in locating this man will be appreciated.

CONVENIENT TOILET ROOMS.

There are dozens of machine shops, and some of them very large ones, in which a goodly sum could be saved each year were the toilet rooms more conveniently arranged in a place where they would be more available. In some shops it is necessary for a man to go down stairs; in other shops they must go up stairs and in a certain shop the men must travel nearly 200 feet to the toilet rooms and back to their work again. It takes considerable time to do all this traveling. Just hold a watch on several of the men and note how long it takes them to travel down stairs and get back to work again. Assume a certain number of trips made by each man during a day, multiply the number of trips by the time required, multiply this by the number of days in the year and figure out the cash value of the time thus consumed.—Ex.

While hot nickel solutions deposit nickel more rapidly than cold ones with a given voltage (i.e. the conductivity of the solution is increased), it is generally considered that the results are not enough better to warrant their use for the ordinary run of work.—Ex.

H. Etches, mechanical engineer and draftsman, has removed his office to 17 Bank of Hamilton Bldg., 34 Yonge St., Toronto. He was formerly chief draftsman with Carnegie Steel Co., Pittsburg; Waterous Engine Works, Brantford; Dodge Mfg. Co., Toronto, and Hanley & Miller, Toronto. His special line is designing special machinery, making working drawings,, and general designing work.



Plant of Canadian Westinghouse Co., Hamilton, showing additions made recently and new buildings planned.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

IN drawing a circle say of 3 inches diameter, you will observe that on spreading out the arms to 1½ inches radius, the tool assumes a triangular shape. One result of this is your reaming out a large hole in the paper, and another is your poorly joined up line.

These troubles are aggravated as the circle to be described becomes larger,

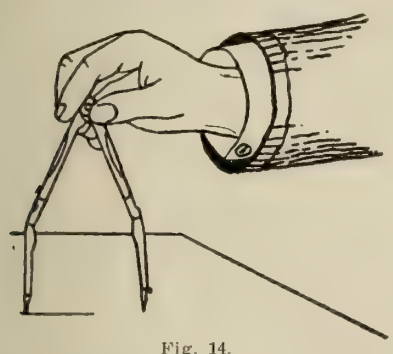


Fig. 14.

and to avoid them, care should be taken to adjust the movable arms so that, irrespective of the circle diameter, these will always be perpendicular to the paper surface, Fig. 14.

Drawing to Scale.

Drawings for the most part are made to a scale convenient to work from, other than full size; that is, the machine or its detail as drawn, bears some definite proportion to the finished manufactured product. This necessity of drawing to scale will doubtless be appreciated without further explanation. The number of views required to properly illustrate the object, determine together with the various size drawing sheets available, the proper scale to be used, consistent with easy, quick and intelligible reading of the drawing by the mechanic who has to work from it.

Figs. 15 and 16 show examples of 12 inch boxwood scales in general use, and should be divided to permit of drawings being made to ⅛, ¼, ⅜, ½, ¾, 1, 1½ and 3 inches per foot. The views shown should only be those absolutely necessary; multiplicity means duplication as a rule and lends itself to increased liability to error on the part of the draftsman, in addition to confusion in the shops. If a footnote therefore will obviate drawing another view, by all means adopt it. In preference to drawing dotted lines to represent internal or rear features, make sectional views to avoid possible misunderstandings.

Fig. 17 gives a suitable variety of lines to be used for the various purposes required in mechanical drawing, and Fig. 18 shows a system of sectional shading for the metals and materials in common use. It may be observed here

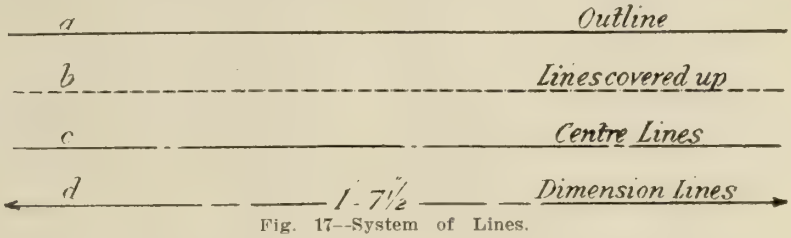


Fig. 17—System of Lines.

that for pencil drawings which are to inked-in or traced, no attention need be paid to line variety or sectional shading, as the foregoing refers altogether to inked drawings or tracings.

Drawings of casting and forging details for a machine should be drawn on separate sheets, the former it may be, to a smaller scale than the latter. Each detail should have its name, the number required per machine, and kind of material marked underneath, so that all the information pertaining to it may be in compact form and ready to the eye. It is usual to abbreviate the names of the various metals, saving as it does time and also space on an oftentimes crowded drawing sheet. The following abbreviations are universally adopted, and in any case quickly become familiar and understood by mechanics in any factory.

Cast iron—C.I.
Malleable iron—M.I.
Wrought iron—W.I.
Machinery steel—M.S.
Cast steel—C.S.
Brass—Br.

Finished surfaces are usually indicated by the letter f written across the line representing the particular surface to be treated. In case a piece is finished all over, mark "finish all over" in black ink below the title. Notes used in connection with a drawing should be connected by a wavy line and arrow to the part to which the note refers. Example of this will be found in the remark "⅛ inch keyway," Fig. 20. The sectional shading is spaced to please the eye and with regard to the area available.

Screw Threads.

Use the conventional method for representing screw threads except in the case of square threads. With the exception of V threads, always give character of thread. When other than standard threads are used, the threads per inch should be given thus: 16 P. I", and when a thread is left-hand, always call attention to the fact.

Arrangement of Dimensions.

Make your figures read from bottom and left-hand side of the drawing as you face it, and place them if possible so that they can be erased without interfering with the lines of the drawing. When dimensioning a sectional area break the section lines as shown on Fig. 21. Give over-all as well as intermediate sizes, and stagger as per Fig. 19. Radial dimensions may be as shown on Fig. 21. In writing or printing feet and inches, a suitable method is per example 7' 3¾" is shown. Restrict dimensions as far as possible to one view;

* Fourth of a series of an Instruction Course. A lesson will be given each month.



Fig. 15—12-inch Triangular Scale.

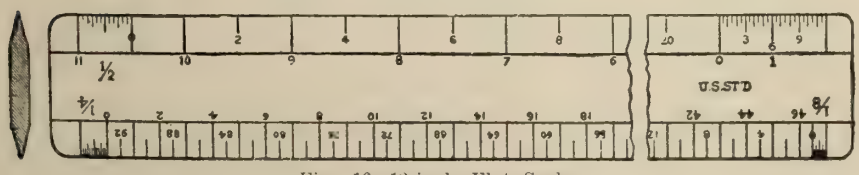


Fig. 16—12-inch Flat Scale.

work from centre lines and finished surfaces and avoid repetition; keep before you the capacity for handling work that the necessary machines in the shop have, and regulate the several parts to conform. Remember that other men have to work from your drawing, and that

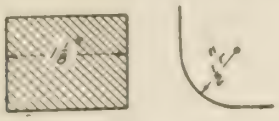


Fig. 21

therefore it is your duty to have it tell them clearly what they are required to make.

The writer is indebted to the Manual Training Magazine for cuts 19, 20 and 21, and some pointed and useful extracts.

"WHEEL COST" A SMALL ITEM.

In many grinding operations the wheel wear (the first cost) is a mighty small item of expense when compared with the actual cost of operation, in which we must figure the horse power consumed, labor, machine investment and the production.

In order to obtain a fair idea of the "cost of wheel," an accurate record was kept of a grinding operation on a 10 x 72" Norton Plain Machine. The work was grinding 35-point carbon open-hearth machinery steel shafts from the black stock, taking off a sixteenth of an inch, reducing from 1⅜" diameter to 1 5-16". A 15 x 2", 24-L. Alundum Wheel, was used and in ten hours' work it showed but .270" wear. The wheel was trued once at the start and once at the end of six hours. Work speed, 25 ft. a minute; wheel speed, 6,100 ft. a minute; table traverse 12 ft. a minute. That means a wheel cost of but a very few cents a week.

It is not good policy, therefore, when endeavoring to reach maximum grinding economy to let the purchase price of a grinding wheel stand in the way of a larger production. Instead of thinking "too much about 'wheel cost'" due consideration should be given to the other factors of cost—labor, which must be figured at from 60 cents to $1.00 an hour; the horse-power consumed in grinding; the production necessary to make the grinding machine investment a profitable one and the many advantages of rapid production. These are the factors that must be weighed carefully when purchasing grinding wheels. Compare them with the "wheel cost."

Economy consists in getting the right wheel for the work and operating it under the most favorable conditions, and the original cost of the wheel in most cases is too small an item to take into consideration.—Grits and Grinds.

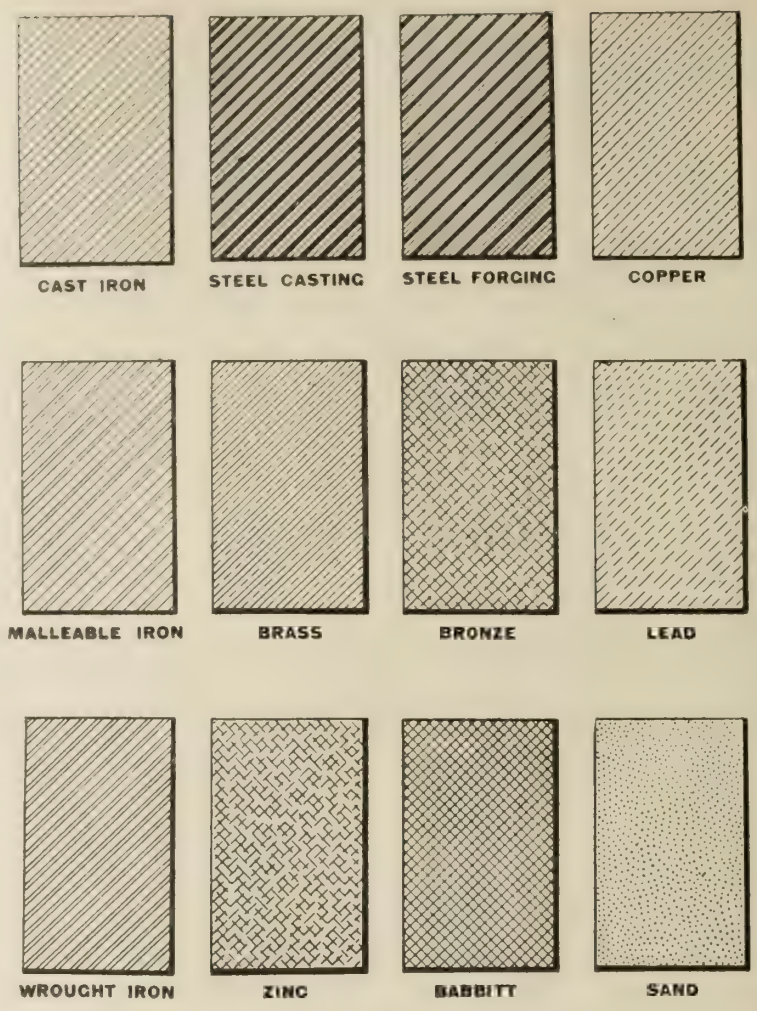


Fig. 18 System of Sectional Shading.

FIRM NAME CHANGE

The firm name of Foss & Fuller has been changed to that of the Foss and Hill Machinery Co. Mr. Henry W. Hill, late of the Wire and Cable Co., Montreal, is now an active partner together with Mr. George F. Foss.

CHANGE OF ADDRESS

The Standard Engineering Co., Ltd., late of 47 Wellington St. E., Toronto have moved to more commondious offices in Rooms 201, 210 and 211, the Dominion Exchange Building, 14 King street east.

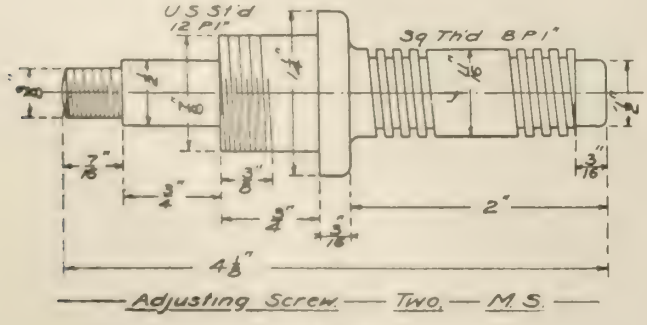


Fig. 19

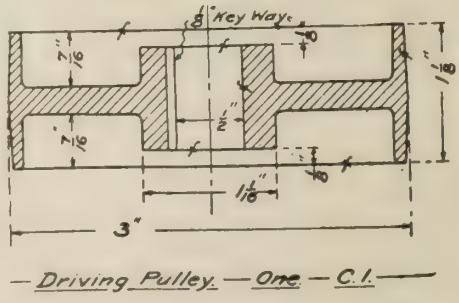


Fig. 20

Boiler Design, Construction, Operation, Repairing and Inspection*

By H. S. Jeffery

The Various Points in Connection With Boiler Practice Will be Clearly Taken up in This Series. The First Article Deals With the Boiler Shell, Including Repairing, Factor of Safety, Hydrostatic Test and Number of Courses. The Series Will be a Complete Text Book on the Subject of Boilers, and They Should be Preserved for Reference.

In Figs. 18 and 19 are shown two types of double riveted, double strapped butt joints. In Fig. 18 all the rivets are in double shear; both the inside and the outside welt strap being the same width, while in Fig. 19 one row of rivets is in double shear and the other row in single shear; the inner welt strap being of greater width than the

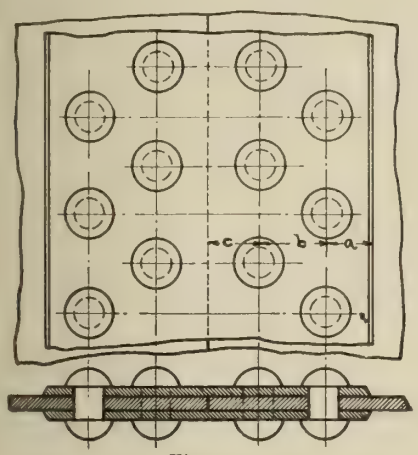


Fig. 18.

outer strap; also, the rivets in single shear are pitched twice as great as the rivets in double shear.

To compute the strength of the riveted joint, Fig. 18, first find the efficiency of the net section of plate and then the efficiency of the rivets, and the

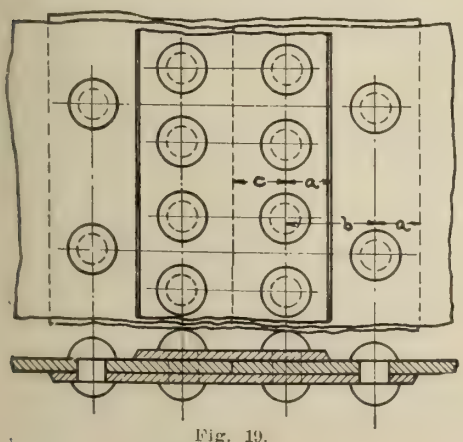


Fig. 19.

lower value of the above will be the efficiency of the riveted joint. Inspection of Fig. 18 shows that the pitch of rivets in both the inner and outer rows of rivets is the same, and accordingly, the efficiency of the net section of plate can be computed from either source.

Now, with the riveted joint, Fig. 19, the outer row of rivets, which is in single shear, are pitched twice as great as the rivets in the inner row, and which rivets are in double shear. Inspection of Fig. 19, and considering the foregoing remarks, shows that there is a minimum and maximum net section of plate, and that part of the rivets are in single shear and part in double shear.

In designing a riveted joint as shown in Fig. 19, or the triple riveted double strapped butt joint as shown in Fig. 20, which is only an extension of the double riveted double strapped butt joint, the riveted joint should be so designed as to make the weakest point the net section of plate of the maximum pitch of rivets.

A cause of failure of a riveted joint is the shearing of all the rivets. With a triple-riveted double-strapped butt joint, as shown in Fig. 20, this mode of failure need not be considered, but with a double-riveted double-strapped butt joint, as shown in Fig. 19, it must be considered.

Continuing the calculations of the riveted joint, Fig. 20, it having been already found that the rivet in single shear has an efficiency of 15.7 per cent., the efficiency of the rivets in double shear, must be found and added to the efficiency of the rivet in single shear. The shearing strength of the rivets in double shear is:

$$\frac{.7854 \times 4 \times 45{,}000 \times 1.85}{60{,}000 \times .5 \times 7.5} = 116.24 \text{ p.c.}$$

Distance Between Rows of Rivets.

15. The distance between the rows of rivets should at all times be sufficient to permit the rivets to be readily driven without cutting or disfiguring the head of the rivet when driving another rivet. The distance a, Figs. 18 and 19, which is the distance from the centre of the rivet hole to the edge of the plate, should be 1¼ times the diameter of the rivet hole. With rivets staggered, as shown in Fig. 18, the distance, b, between rows should not be less than 1½ times the diameter of the rivet hole, while the distance, b, of the riveted joint, Fig. 19, should be sufficient to permit the outer welt strap to be calked. The distance, c, of butt joint, especially the type of joint, as shown in Fig. 19, should be at least 1¾ times the diameter of the rivet hole.

Girth Seam Rivets Assistance.

16. With double-strapped butt joints, inner strap extended, as shown in Fig.

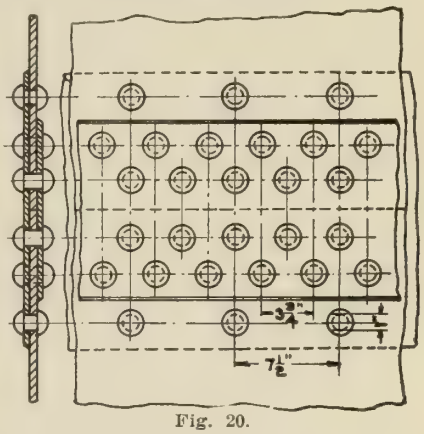


Fig. 20.

20, the net section of plate adjoining the girth seam will be less than the maximum net section of plate, this being shown by the letters a and b, Fig. 21. The net section a is not, however, weaker than the net section b, for to rupture the net section a, will require a number of the rivets in the adjoining girth seam to shear, the same being in-

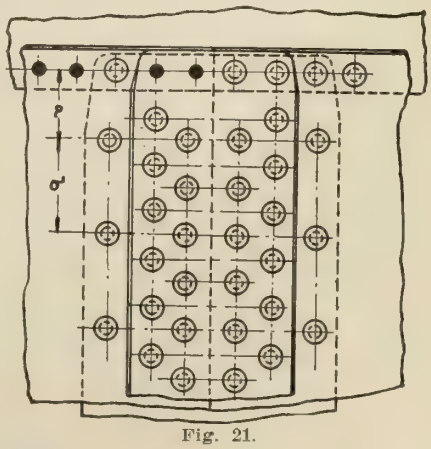


Fig. 21.

dicated by the rivets in black. Usually the strength of the net section a, and two rivets in the girth seam is sufficient to make the calculations show the efficiency of these parts greater than the net section b.

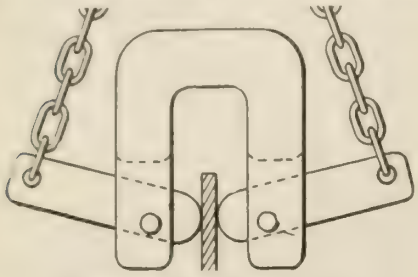
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

PLATE HANDLING DEVICE.

By K Campbell

One of worst classes of stock to be handled, is plates All sorts of devices, clamps, etc., have been invented. The electro-magnet is used with great success but in many plants, especially the smaller ones a jib crane or a yard



Toggle Plate Lifting Device.

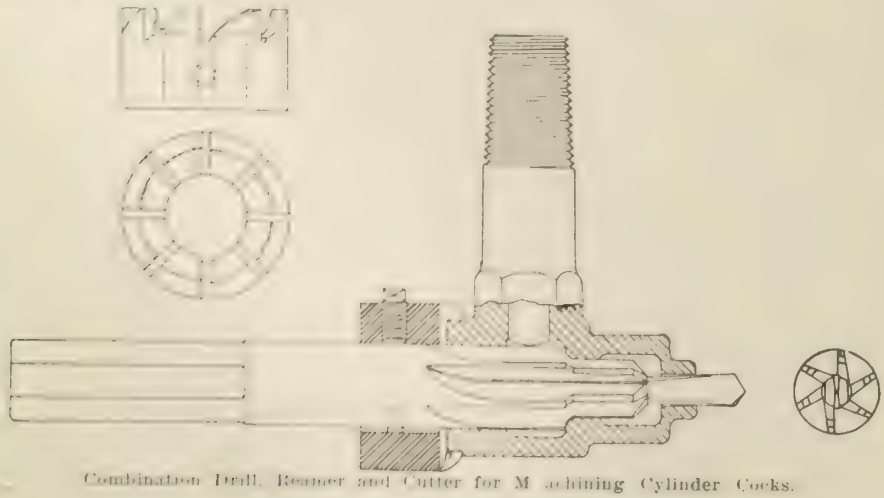
crane is used to advantage. In connection with these two methods, the device shown in the accompanying sketch can be used to advantage.

The two jaws are pivoted in a V clamp and form a toggle, gripping the plate very securely when unloading it. There is an appreciable saving of time in handling and there is no chance of the plate slipping as the tendency to slip causes the jaws to grip it more firmly.

COMBINATION DRILL, REAMER AND CUTTER.

By Efficiency.

The combining of operations is one means of securing greater efficiency in the shops In the accompanying illustration is shown a combination drill, reamer and cutter for machining cylinder cocks Instead of tooling, they are by means of it, bored, seated and faced, top and outside The operations are performed with the combination tool in one-eighth the time of that required by tooling out.



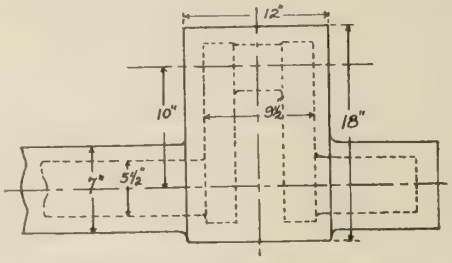
Combination Drill, Reamer and Cutter for Machining Cylinder Cocks.

FORGING VS. HIGH-SPEED STEEL.

By L. L. K.

It is sometimes debatable how much stock should be left on a forging to secure quick machining. Since the introduction of high speed steel it is found to give the greatest economy in production when little time is spent on the forging.

In the accompanying illustration is shown the dimensions of a forging which



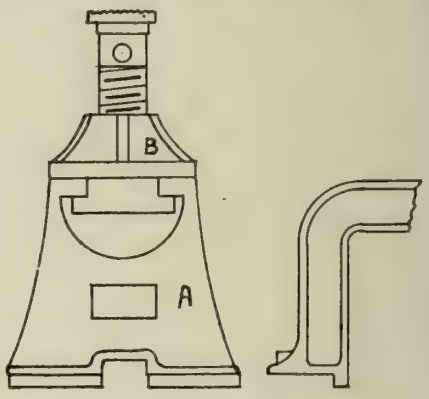
Rough Forging and Finished Shaft.

the writer took recently from one lying in an Ontario machine shop. The dimensions shown by the dotted lines were taken from a blueprint, which was furnished the workman. The forging was finished to size by using high speed steel.

LOCOMOTIVE JACK.

By Service.

In erecting a locomotive over a pit a special jack with a frame extending across the pits is a necessity. In the one here shown the part A is of steel and extends from rail to rail. B is brass. The jack can be used in any position along the base. Convenience in its



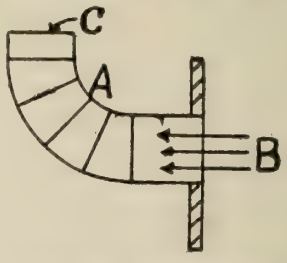
Locomotive Jack.

use, is the special feature which commends it.

FRESH AIR WITHOUT DRAFT.

By M. E. D.

The accompanying sketch the writer saw in use recently to obtain fresh air without a draft. Pipe elbows were used and were fitted into a board as shown. This board was the width of the window and about 6 ins. high. Air entered



Fresh Air Without Draft.

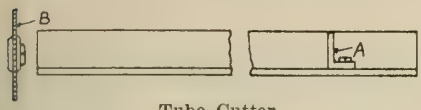
at B, the part A projecting inside. Four were used on each window, so that the amount of fresh air could be regulated. This was done by having caps fit over the pipe at C and removing as many as necessary. This device is especially useful for winter months or in a timekeeper's or cost office were a direct draft would soon mix up the papers.

TUBE CUTTER.

By Onlooker.

A simple arrangement for cutting tubes to length is shown in the illustration. An angle is used with A adjustable so that any length may be cut. B

is a saw. The angle is pressed forward by a simple foot arrangement, and is returned to place by three weights secured to it. In order to keep the angle perpendicular to the saw, the angle has



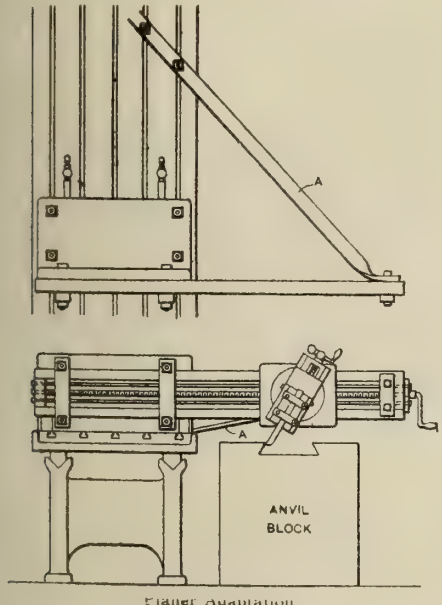
Tube Cutter.

three blocks which run in slots in the table. The weights are fastened to the angle just above the blocks. By this method quantities of tubes were quickly cut to length without the necessity of measuring each tube.

WORK THAT IS TOO LARGE FOR THE PLANER.

By Frederick Seabury.

The accompanying line engraving shows how a steam-hammer anvil-block that was too large to go on the planer, was machined. The block was first leveled up on the floor beside the planer, so that the top of the casting was a little below the top of the planer platen. For



Planer Adaptation

safety the casting was clamped to the floor, although its weight was such that there was no great danger of its moving under the thrust of the cut. The cross-rail with the attached head was then removed and clamped securely to a heavy angle-plate, which was bolted to the platen. A substantial diagonal brace A was then fastened to the cross-rail and platen as shown. The tool was fed, of course, by hand, and the dove-tail for the dies was planed by the use of the adjustable head in the usual manner. The job was satisfactory in every way and caused considerable comment in the shop.—Machinery.

PLANER EXTENSION.

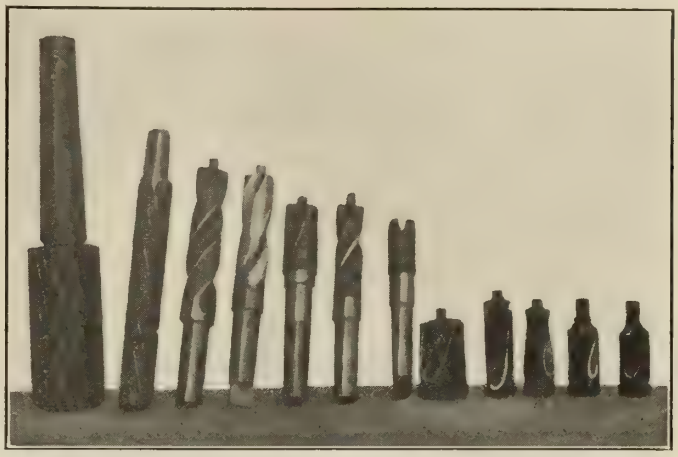
In the shops of the Collingwood Shipbuilding Co., Collingwood, Ont., there is only one planer—a side planer, with a 36-inch table. Wide articles which must be faced on the side could not be done on the planer, on account of the over-hanging part having too great tending to tip planer table. J. Smith, manager, got out the idea shown in the accompanying sketch, for increasing the capacity of the machine, so that it would take almost any size article. A is the planer, B and C two 10-inch I-beams, the former being the length of the planer bed and the latter the length of the table. Between the two beams are cast iron rollers D, held in position by side straps E. The beam B may be moved any desired distance up to ten feet away from the planer on the I-beam F imbedded in the floor, and to which the beam B is bolted.

The article to be planed is placed on the planer as desired, over-hanging onto beam C, which is slightly lower than the planer table, so that blocking is necessary. The article is bolted to this beam. The rollers are machined, but the beams are in their rough state.

HIGH SPEED STEEL DRILLS AND REAMERS.

By K. Campbell.

To make a whole drill or reamer from high speed steel is expensive, but the efficiency of the high speed steel may be obtained by making the cutting part of this steel and the shank of a less expensive steel. In the accompanying halftone are shown a number of shop tools where the cutting ends are of high speed steel. The five at the right are reamers which may be screwed on to shanks such as has been done on the next three. Thus one shank will accommodate quite a variety of sizes of high speed drills, reamers, etc.



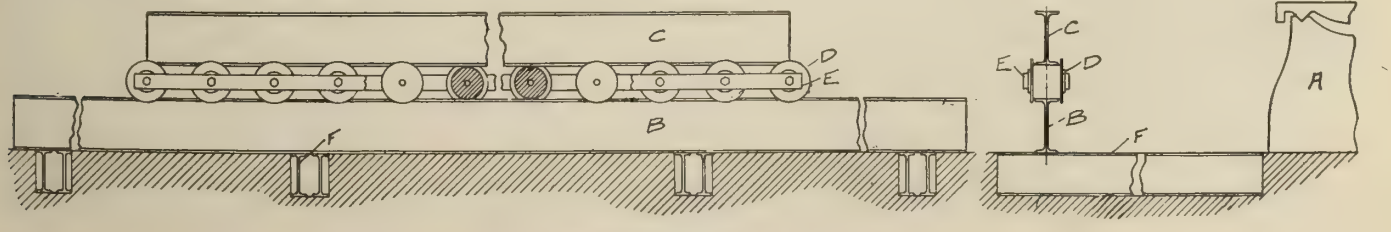
High Speed Drills and Reamers.

BUSINESS TRANSFER.

Bain & Mitchell, Y.M.C.A. Building, have transferred their business to Francis Hankin & Co., 231 Coristine Building, who have opened a machinery department, with A. G. Webster, of Bain & Mitchell, in charge. F. Hankin & Ca. will handle the agencies formerly held by Bain & Mitchell.

A really great man is known by three signs—generosity in the design, humanity in the execution, moderation in success.—Bismarck.

A grinding wheel cannot be judged by its color. Several wheels of the same grit and bond may be of different colors, owing to the material used. The conditions in the kiln will also sometimes affect the color.



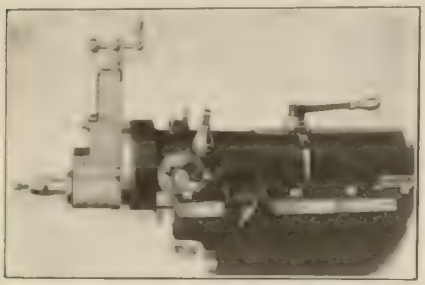
Planer Extension.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, and Blacksmith Shop or Planing Mill.

AUTOMATIC VARIABLE FEED.

The accompanying half-tone shows the automatic variable feed to the head as applied to the Rockford shapers. It will be noted from the illustration that the



Automatic Variable Feed to Shaper Head. Rockford Machine Tool Co., Rockford, Ill.

arrangement has been designed with the view of simplicity and absence of complicated parts, making it serviceable and not liable to get out of order. It feeds the tool either up or down and operates at any angle. The triangular shaped incline on which the roller rides can be readily adjusted to suit the position of ram or moved out of the way when not in use.

The lever shown on the side of ram with spring pin, regulates the amount of feed. Six changes are provided, as follows: .008, .016, .024, .032, .040, .048. The lever on top of the ram reverses the feed and throws the gears out of mesh, by placing lever in central position when not in use.

The Rockford shaper is manufactured by the Rockford Machine Tool Co., Rockford, Ill., U.S.A.

REMINGTON BENCH LATHE.

The accompanying illustrations show the bench lathe of the Remington Tool and Machine Co., Boston, Mass., which has several new attachments. The lathe

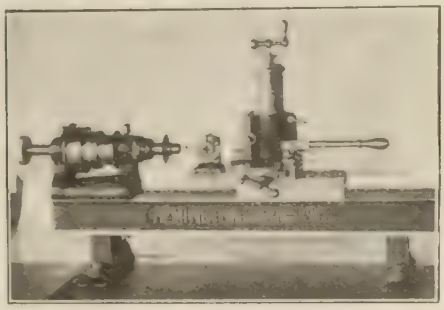


Bench Lathe with Forming and Cutting-off Slides. Remington Tool & Machine Co.

has an adjustment of two inches to increase the tension on the belts.

The spindle is of the two angle type. It takes 5-6 in. stock through the self-centering spring collet chucks, $\frac{3}{4}$" through the live spindle when a universal chuck is to be used. The end-thrust adjustment of spindle is accomplished by advancing a fibre collar to come in contact with the shoulder on the front of the spindle. This feature allows holes up to $\frac{1}{2}$" being drilled continuously without sticking or stopping of the spindle.

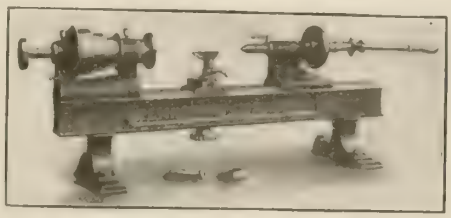
The tail stock is provided with combination screw feed and lever feed of the



Remington Bench Lathe.

spindle. The horizontal movement of tailstock spindles is 3 ins. The eccentric end of binder bolt has adjustment for wear.

The attachments comprise the turret with forming and cutting-off slide; milling attachment which can be used with lever as a hand milling attachment, or with ball crank handle for screw feed; and grinding attachments, inside and outside. The turret attachment has six



Precision Bench Lathe.

holes and is provided with independent stops for each tool. The forming slide has a swivel tool post graduated in degrees so that straight forming cutters may be used in turning any degree of angle.

AUTOMATIC SPRING AND AIR CHUCKS.

The Garvin Machine Company, New York, is putting on the market a very complete line of automatic chucks with two and three jaws in various sizes.

Fig. 1 shows a two-jaw chuck disassembled. The body A is of the ordinary type but carries an actuating jaw B, which has a series of inclined slots milled in it, tongues in the central draw plug C fitting into these inclined slots. By moving the plug to the rear both jaws are forced toward the center by the wedging action of the inclined slots and tongues. The dovetailed jaws are adjustable by means of a screw on the actuating jaws to and from the centre, and when adjusted are locked in place by a locking screw. The dovetailed jaw is dovetailed on both sides, so that it can be reversed and grip either external or internal work. In the latter case an extra piece C, with the diagonal slots running in the opposite direction, is necessary. The adjustment of the jaws is, therefore, entirely independent, but in operation they work simultaneously.

In detail the three-jawed are similar to the two-jawed chucks. The three-jawed chucks are furnished with the regular step type of jaws and can be fitted with various other types of jaws to accommodate all classes of work.



Fig. 1 Two Jaw Chuck Disassembled.

The chuck is screwed on the nose of the spindle in the usual manner; a pull rod or tube is then screwed into the central plug in the chuck, and the other end attached to the operating mechanism. A number of styles of operating mechanisms can be applied, governed by the conditions found in practice.

Inside the cone pulley is mounted a heavy spring, around the spindle. At the rear it bears against the spring-thrust collar through which passes a taper pin. The pin is a drive fit in the collar and also in the draw rod, but it slides, in an elongated slot, in the spindle. The spring exerts a pull of 800 pounds on the draw rod, and the wedging action of the inclined planes in the chuck multiplies this by four, giving a resultant grip, exclusive of friction, equal to 3,200 pounds on the work. A foot treadle is attached to the operating plunger at the rear end of the spindle. A slight downward pressure of the treadle carries the tube forward and automatically carries the friction out of

the cone. The momentum of the spindle is stopped by the brake pins and washer at the rear of the front box. The cone pulley is now running idle. The full movement of the treadle opens the chuck jaws, releases the finished piece of work and the chuck is ready for the reception of the next piece.

On releasing the treadle the pressure of the spring first closes the jaws on the work and then carries the friction into the cone, which starts the spindle at full speed.

Where compressed air is obtainable the system of a piston inside the cone pulley is used. Piping is attached to

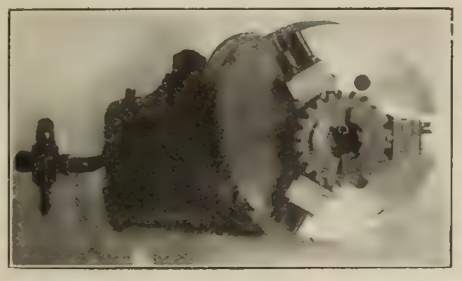


Fig. 3. Arrangement for Gripping a Spur Gear on the Pitch Line.

an air inlet at the end of the spindle, the operating valve being placed in a position convenient for the operator.

When air is turned on it passes through the chamber to the front of the piston, forcing it back and closing the chuck jaws on the work. The pressure of the air in the opposite direction carries the cone pulley on to the friction which starts the spindle forward at full speed. On releasing the air, the spring inside the spindle forces the pulley off the friction, and the momentum of the spindle is checked by a multiple-disk brake on the rear spindle bearing, which leaves the cone pulley running free. The pressure of the spring in the other direction carries the tube forward, opening the chuck jaws, and the machine is now ready to receive the next piece.

The air pressure necessary for operating is from 70 pounds up. For work which does not require a heavy grip, a reducing valve may be placed in the pipe and adjusted to give the necessary pressure.

With the air-operated chucks the jaws are at all times forced against the work by the elastic pressure of the air, and any variation in size is automatically accommodated.

These operating mechanisms are all self-contained and there is at no time while the machinery is running, any pressure on the spindle boxes.

The air system is, of course, the most powerful and convenient, because it saves physical effort, and where the number of pieces handled per day exceeds 1,000, it is the most desirable, but where there is no compressed-air system or where the number of pieces does not exceed the limit stated above, the spring actuated chuck will be found efficient.

The methods just described show applications to machines built by the Garvin Machine Co., but machines already in use can be equipped with a spring system or an air system. These mechanisms are mounted on the rear end of the spindle. They operate the chuck only, the starting and stopping being done by the countershaft. They are for this reason somewhat slower than those already shown, as the spindle is not stopped instantly.

A double air cylinder is also made, which takes the air in on either side of the piston, gripping and releasing by air pressure without the aid of a spring. This system is convenient for gripping either internal or external work, as both these can be accommodated without reversing the jaws of the chuck.

Fig. 2 shows a three-jaw air-operated chuck, arranged on a Garvin hole-grinding machine for gripping a bevel pinion by the pitch line.

Fig. 3 shows the arrangement for gripping a spur gear on the pitch line. The jaws are adjustable to and from the centre, for different-sized gears, they also carry a hardened plate on which is mounted a hardened roller which grips

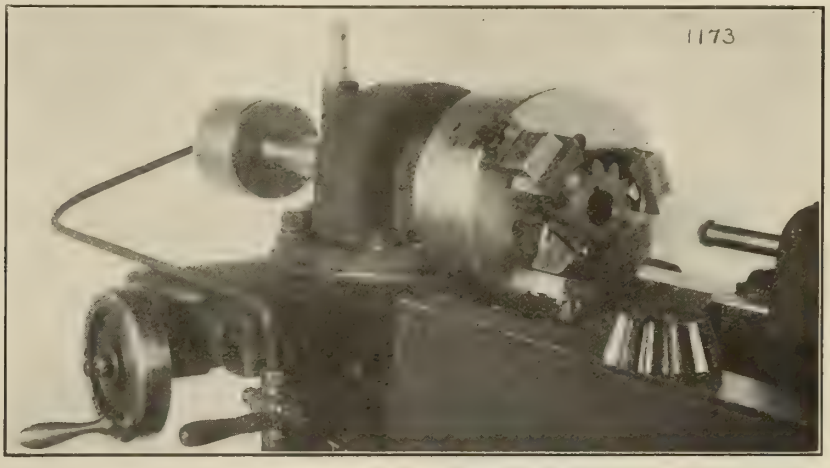


Fig. 2. Three Jaw Air Operated Clutch.

the gear at the pitch line. This plate is adjustable sideways for gripping gears where the number of teeth is not divisible by three.

These chucks may also be operated by the hand-lever mechanism. With this mechanism the chuck jaws are opened 1-16 inch on the diameter, which is sufficient for a grip on finished work. The spring or air-operated mechanisms give an increased opening and the three-jaw chucks are arranged to open $\frac{3}{8}$ inch, while the two-jaw style is made in two types, one of which opens $\frac{3}{8}$ inch and the other $\frac{3}{4}$ inch on the diameter.

The chuck shown in Fig. 4, known as the automatic index chuck, has a wide field of adaptability for that class of work having two or more points of work to be operated on lying in the same plane. These chucks are identical in construction with the former ones except that they have index jaws.

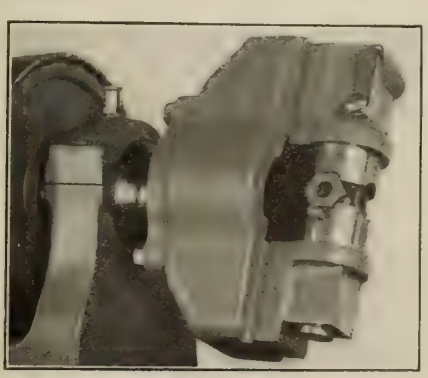


Fig. 4.—Automatic Index Chuck.

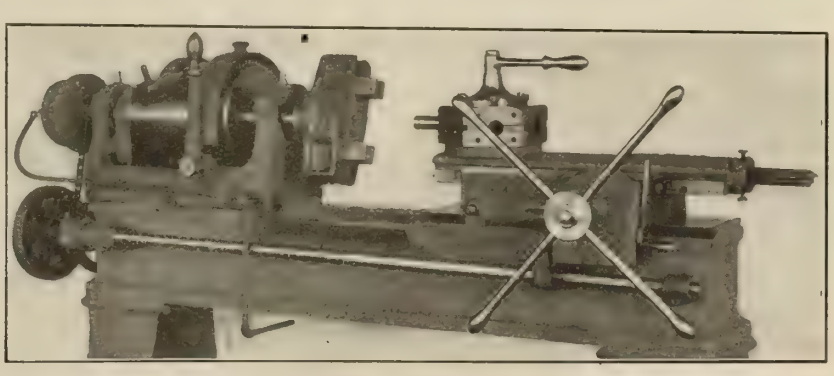


Fig. 5.—The Outside Type of Air Control.

Fig. 5 shows a Garvin geared friction-head power-feed monitor lathe, equipped with a 12-inch two-jaw adjustable reversible, automatic chuck which is operated by the outside air system. The stopping of the spindle is, in this case, done by throwing the friction lever on the headstock to a neutral position

FULL UNIVERSAL RADIAL DRILL.

The John Bertram & Sons Co., Dundas, Ont., have placed on the market a 6 ft. full universal radial drill shown in

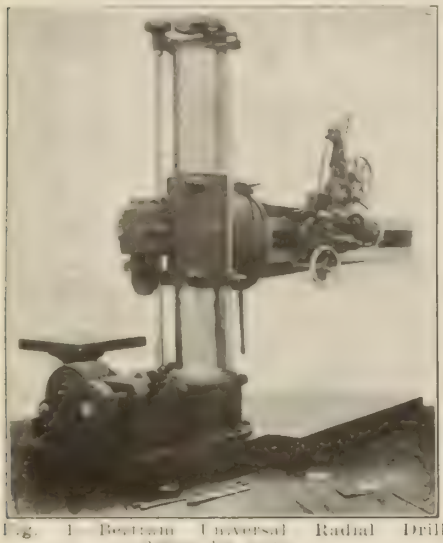


Fig. 1 Bertram Universal Radial Drill driven by motor.

the accompanying illustrations. It will drill to the centre of a 12 ft. circle. The column carrying the arm revolves on ball bearings and can be clamped in any position. The arm is raised and lowered by power. The spindle is counterbalanced and has quick return, 16 changes of speed and three changes of feed by hand or power.

The vertical travel of spindle is 17 ins.; spindle is bored to Morse taper No. 5, maximum distance spindle to

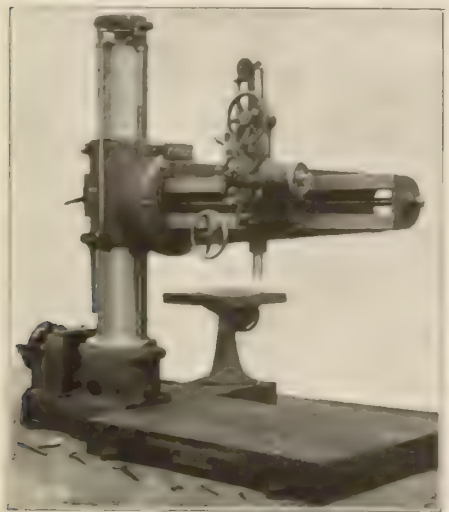


Fig. 2 Bertram Universal Radial Drill driven by single belt through speed box

baseplate is 73 ins., minimum distance spindle to baseplate, 4½ ins.; and maximum distance face of column to spindle is 72½ ins. The drill is supplied with standard work table of box section having slotted top and side. The baseplate is slotted for bolting work.

Fig. 1 shows a 6 ft. radial drill with the drive by means of a 5 h.p. constant speed motor through speed box. Fig. 2 shows a 6 ft. radial drill driven by a single pulley through speed box instead of by motor.

NEW DESIGN ROTARY PLANING MACHINE.

The diameter of cutter heads in the machine shown, over tools 26 in., length of in and out adjustment to each head by hand 2½ in., in length of cross feed to each saddle 5 ft., size of each work table 3 ft. by 6 ft., maximum distance between the faces of cutting tools 30 ft.; minimum distance between the faces of cutting tools 6 ft. 3¼ in., machine occupies a floor space of 37 ft. by 5 ft. 6 in. in the base, and the length of the cross slide for each head is 10 feet.

The cutter heads are steel castings with angular slots for the reception of tools cut from the solid with a steel band shrunk on the periphery, into which the tool retaining set screws are fitted. The internal driving face plate gear has teeth cut from the solid and the teeth of the driving pinion as well as for transmitting the feed are cut from the solid.

The drive to each head is by means of a 7½ h.p. Westinghouse Electric & Mfg. Co. type "S" motor, having a speed of 975 r.p.m. Motion is further transmitted through spiral gears to the driving worm wheel. The driving worm is of hardened steel and the driving worm wheel has a bronze ring with teeth of steep lead and both are encased for lubrication, and where necessary roller bearings are provided. The left hand machine is stationary on the base and the right hand machine is arranged to be adjusted from the minimum to the maximum distance by means of a 5 h.p. motor mounted on the back of the base, motion being transmitted from the motor through spiral gears to the worm wheel shaft, in turn meshing with the worm wheel, which controls the rack pinion. This machine is especially adapted for rapid production in finishing cast iron and structural columns on both ends.

This machine is manufactured by the Newton Machine Tool Works, Philadelphia.

FLEXIBLE HACKSAW BLADE.

This is not an illustration of a dog collar and chain, but rather it shows the work of a Culley Flexible Hack Saw Blade, manufactured by the Simonds Mfg. Co., Fitchburg, Mass. and Montreal, P.Q. There were 47 separate



Sample of Work of the Culley Flexible Hack Saw Blades.

rings made from a 1 inch pipe, each ring slit and the chain formed. After making this number of cuts the condition of the blade was so good that the teeth are clearly defined, even in this greatly reduced illustration. The remarkable flexible property of this blade is shown by its being bent in a complete circle.

NEW LATHES OF AMERICAN TOOL WORKS CO.

The American Tool Works Co., Cincinnati, Ohio, are placing on the market a new line of 36 and 42 in. lathes, the special feature of them being the quick change mechanism, all the gears in which are steel.

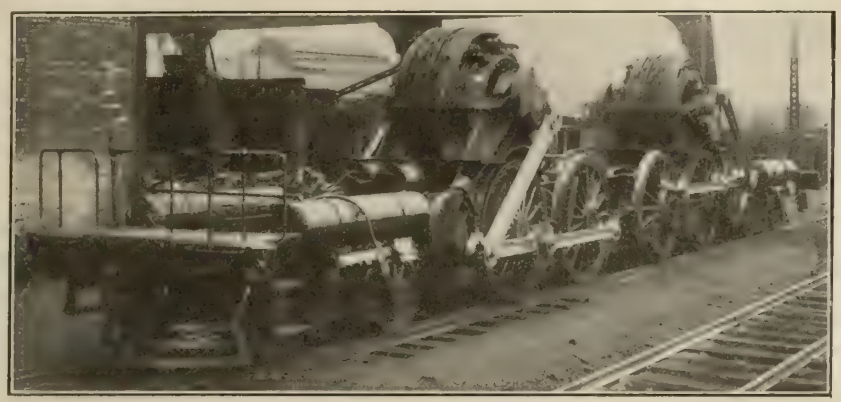
The material used in the gears is made from either bar steel or drop forgings. This mechanism is embodied in a self-contained unit carried on the front of the bed and provides 32 fundamental changes of threads ranging from 1 to 14 per inch. In addition to this a com-



Special Rotary Planing Machine, Newton Machine Tool Works, Philadelphia.

pound quadrant gear is provided on the end of bed which will furnish 16 additional changes, thus affording 48 thread and feed changes ranging from ½ to 28

threads including 11½ pipe thread and from 4 to 244 cuts per inch. The 32 changes in the box are all obtained through the medium of a cone and tumbler gear and two sliding clutches of the selective type. Anyone of these changes may be instantly obtained while the machine is running.



Electric Locomotive, Showing Motors and Running Gear.

The quadrant mentioned also provides means for obtaining through the medium of loose gears any odd rates or feeds which may from time to time be desired. The cone gears are all of the Brown & Sharpe 20 degree involute pointed type which provides an especially strong tooth and greatly facilitates the engaging of the gears while running. The coarse threads and feeds are all obtained through the cone, and no member in tne box does at any time run faster than the initial driving gear.

ELECTRIC LOCOMOTIVE.

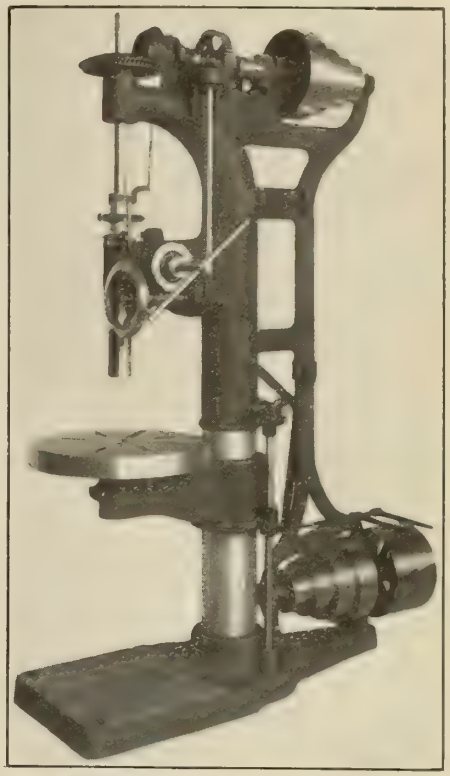
In the accompanying illustration is shown the motors and running of a Westinghouse electric locomotive for D. C. 600 volts. The weight complete is 156 tons; weight on drivers, 200,000 lbs.; total length over all inside knuckles, 64 ft. 11 ins.; tractive effort 79,200 lbs., and normal speed 60 miles an hour.

The weight of the motor is 43,000 lbs., and the maximum horse power is 4,000 h.p. The locomotive is of double design, the two parts being connected at the driving wheels ends. In the event of one motor being cut out, the other motor will operate the whole locomotive and can be controlled from either cab.

NEW DRILLING MACHINE.

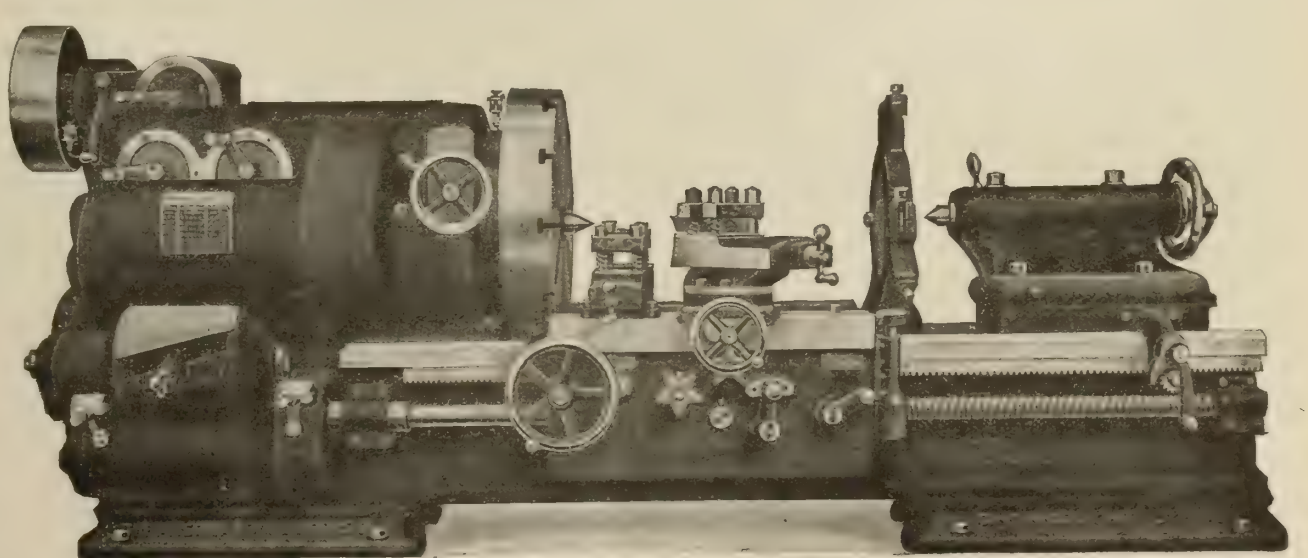
The solid stocky design and extreme simplicity are the distinguisning features of this new stationary head drilling machine with geared feed, the first lot of which the Sibley Machine Tool Co., South Bend, Ind., have just completed. Its rigidity and the geared feeds adapt it to the heavy cuts of modern manufacturing. While having the same range as similar models formerly made by this company it is considerably lower in height.

It will be noted that the feed mechanism derives its power from the top drive shaft, and all the gearing is completely enclosed and running in an oil bath. Four changes of feed and a neutral position are effected by moving a small knob in the centre of the hand wheel. The convenience of this arrangement is obvious.



New Drilling Machine, Sibley Machine Tool Co., South Bend, Ind.

The automatic stop collar on the spindle sleeve, trips a latch at the desired depth of hole and the worm swings away from the worm gear. Unusually severe tests have been tried with this feed, and results were so successful that the Sibley Machine Tool Co. have adopted it for their entire line, excepting the 20'' and 22½'' sizes.



36 and 42 in. Style, American High Duty Lathe.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests [illegible] progress, construction [illegible] power developed from steam, gas, electricity [illegible] Canada.

The MacLean Publishing Co., Limited

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New York - - R. B. Huestis, 115 Broadway. Telephone 2282 Cortlandt

FRANCE

Paris - John F. Jones & Co., 31bis, Faubourg Montmartre, Paris, France

Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00; Great Britain, Australia and other colonies, 4s. 6d. per year; other countries, $1.50. Advertising rates on request.

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Vol. VII. May, 1911 No. 5

DO THE HARD THINGS FIRST.

A certain manager has over his desk the motto in large letters "Do the Hard Things First." It is a motto that can be passed down to the superintendent, foreman and men. Many hard or disagreeable duties must be done and it is best to use the freshest efforts to accomplish them. The "putting off until to-morrow" in the hopes someone else will do the job is a bad policy. Attempting the hardest things first will make the day's work pleasanter and will give you a greater interest in your work.

YOUR PERSONAL EQUIPMENT.

Is [illegible] necessary and consequent improvement in the [illegible] equipment? There is another form of equipment which requires very careful examination with a similar object in view. We refer to the personal equipment—to the measure of our knowledge of the elements which constitute the ideal in manufacturing, so that the product of our own establishments shall bear some reasonable relationship to that ideal. Is our personal equipment sufficient to meet the demand with the growth of the manufacturing industry?

The mechanical equipment must ever be subservient to the personal or mental one. Even the machine shops where excellent work is being turned out, remove the men from the lathes and substitute men of but average ability, and, regardless of the efficiency of the mechanical equipment, the quality of the product will immediately drop.

We are apt to forget that the same principle applies in the case of the executive head of the establishment. Although an examination of the product of some of the leading manufacturers, would prove the correctness of the principle.

It is well to take stock as to the extent and value of our personal equipment. Will we be able to infuse into the product of our establishment a distinctive character and quality, or is our work to sink into mediocrity? Have we broadened the outlook and firm grasp upon the principles of machine shop work and management, or does our personal equipment bear the marks of wear and tear and age?

Ideas will not last for ever. They become old-fashioned, worn out and commonplace. You must be progressive, you must keep up with the present trend of practice in the shop or in its management. You must develop your personal equipment.

TECHNICAL EDUCATION FOR MECHANICS.

With evidences of largely increased agricultural, mineral and industrial development ahead, educationalists are stirring themselves to activity on behalf of those whose work lies in these particular spheres. Schemes are being propounded and preparations made, to enhance the value of labor, in commercial and industrial enterprises, by establishing technical schools in our large cities and manufacturing centres, and it is gratifying to note that the movement emanates from a substantial and reliable quarter, ensuring stability and ultimate success. The leading representatives of our great corporations foresee enough to appreciate the importance of technical education as a civilizing, vital, energizing, and inestimable asset of this or any country, and with commendable determination are seeking to transform their ideals into substantial realities.

It should be common knowledge, that the acquirement and application of technical education are unlimited in degree at least, and that individual development is necessary to its pursuit. Undue haste to be on equality of equipment with older countries is however discernible, and is to be regretted; because likely to retard real progress, and delay equal and certain successful results. A jealous, or it may be patriotic spirit due to a comparison of superior conditions in England, France, Germany and the United States, with those existent in Canada, has overcome the usually calm, calculating natures of these responsible for the movement, and will have the inevitable result in due course, of their hopes being but partly realized, and the shifting of the blame to the apathetic response of those for whom the effort was inaugurated.

Pessimistic yet true, because impossible otherwise under the circumstances, and why? The answer is, we are not ready for the equivalent equipment of the countries named, ours being comparatively speaking a new country.

The individual development already referred to as necessary is not sufficiently advanced, yea has not been more than started in this Canada of ours, and satisfactory results cannot therefore be looked for. The ground is not yet prepared, and will not be so for some years to come. The western farmer does not equip himself with the most modern and expensive agricultural implements until he has his section cleared. He does not reason indiscriminately, and expect that agricultural implements because they are named so, and were bought of a reputable maker, will overcome the neglect of clearing and ensure a bountiful harvest. Neither does a mining company, a reputable one at least, reason that it must launch into large capital outlay because rich ore has been located in the vicinity of its claim. It rather stays

its hand, however hopeful the outlook, until its own initial development uncovers wealth warranting the expenditure. For the same reason a magnificent technical institution, second to none in appearance and equipment, should not be used to get results from infinitely more difficult ground than our farmer friend contends with, or from what is in mining nomenclature a prospect whose being is justified only by what others are getting.

The old saying, "till the ground," has assuredly a weight of meaning for our technical education enthusiasts, yet it need not damp their zeal, but rather help to direct it properly and effectively. There must needs be a full realization of the condition of those sought to be served and benefited. To those already engaged in the work of technical education as applied to leading Canadian industries, it is at once apparent that knowledge of the condition of the ground material to be operated upon, does not have the prominence it should in the formulation of the promoters' plans.

It is no disparagement of students who do or may attend technical instruction classes to speak in this manner of their status. Instruction has in the past been confined to a few obscure although most effective courses in various branches. Careful individual study of each man's requirements, necessitating small classes and high fees, and an interest in his daily problems of the factory, are necessary elements in the successful prosecution of technical education.

Experience, however, goes to prove that with a plethora of ideal teaching conditions, results are not in any way commensurate with the instruction given ; proving the utter hopelessness of even approaching this low percentage efficiency in one majestic institution of congested classes. Of course this congestion will be notoriously short-lived ; for before the close of the courses, the attendance will have dwindled so much so as to call for microscopical investigation of its existence, not to speak of similar but more minute examination for results.

This is a universal experience, differing only in minute degree in countries with long established technical institutions. The actual number to really benefit is simply a skeleton of the total enrolment, and as Canada is a beginner, she should start with a modest equipment. Most of these others even with their paucity of results to-day have grown steadily from zero upwards and are still growing, in equipment too, commensurate with resultant progress. We should not presume to start at their present stage, and try to keep pace with them.

CARING FOR MACHINERY.

Any thorough system of inspection that will prevent rough usuage or neglect of machinery in the machine shop is commendable. In preventing neglect as well as in preventing accidents a pound of prevention is worth several tons of cure.

In some plants an inspector makes daily rounds inspecting carefully all elevators and elevator cables, power equipment, shafting, bearings and machine tools. The most remote corner receives as rigid an inspection as those within easy reach and the result is that the plants run without accident or breakdown for full time year after year.

The idea is a good one and may be carried still further. When certain machines are idle several months in the year they should not be allowed to rust. In too many shops this is the case. It reminds one of the farmer who leaves his mowers and binders exposed to all weather, winter and summer, and then complains because the machines wear out in a short time or do not give good service. If the idle machines are thoroughly cleaned and protected against any liability to rust, the result will be more than satisfactory.

The eternal vigilance of a trained inspector or force of responsible trained inspectors will result in removing all irregularities or any chance of neglect or accident.

BE ABLE TO SAY YES AND NO.

A certain factory manager who has made a success of his business, attributes his success largely to his ability to say "yes" and "no" and to say them at the proper time. He is a believer, as he himself, explains, in good old Saxon words. If he does not want any new factory equipment or stock, he says so without beating around the bush. On the other hand, if he thinks a thing would help him to secure greater economy in the shop or greater production without a large additional expense, he does not hesitate to accept it.

Undoubtedly there are managers, superintendents and foremen who lack the power to make up their own minds without undue delay. They temporize, lacking the courage to refuse something, which their common sense condemns, or to accept a thing which looks good, but involves new ideas and added risks. The ability to make quick decisions and make them wisely, is one of the greatest gifts assisting in making a successful manager, particularly if he has the added quality of stick-to-itiveness.

TOPICS OF THE MONTH.

An exchange of ideas will bring you excellent returns. Try it.

* * *

There should be co-operation between the mechanical and purchasing departments when ordering machine tools.

* * *

Manufacturers are beginning to realize that pure air and lots of light are factors affecting the cost of production.

* * *

Using the proper size motor for the work to be done means a saving in power and an increase in the shop efficiency.

* * *

A factory telephone system will keep foremen in their respective departments and thus keep them within reach of the men requiring their advice.

* * *

If we may judge from the number of new machine shops and additions to older plants, the machinery dealers will have a busy season during the remaining months of 1911.

* * *

The machine shop backyard scrap-pile is worth looking after. The various metals should be separated into respective piles and each pile disposed of at the proper figure. In this way the scrap pile is turned into a valuable mine.

* * *

Several managers of industrial plants, recognizing the value of Canadian Machinery, have not only renewed their subscriptions, but sent in subscriptions for a number of their employes as well. Such an expression of good will on the part of the managers, is thoroughly appreciated by the men.

POWER EQUIPMENT & APPLICATION

Expert Descriptive Articles Dealing with Selection and Purchase of Most Suitable Power Equipment for All Purposes, its Proper Application, Installation, Operation and Treatment.

GEARS AND GEARING*

By A. E. B.

Rawhide gears should be used with as coarse a pitch as possible and the breadth of the teeth should be about one-third more than cast iron gears. If the work is heavy it is well to house the teeth between flanges.

Rawhide gears are superior to fibre gears but are more or less affected by oil, water and changes in temperature. They should be kept well varnished. Fibre gears are not so affected and do not require to be varnished. The action of these gears is practically noiseless.

Forms of Teeth

Gear teeth are shaped to the form of certain curves and are known by those curves as Cycloidal and Involute.

Cycloidal teeth are formed by two curves which commence at the pitch circle and curve in opposite directions.

Involute teeth are formed by one curve and are most desirable for general practice, as greater care must be exercised with the use of Cycloidal teeth that the centre to centre distance between the gears is correct to insure a uniform velocity of the driven gear.

Involute teeth are also much stronger for the same pitch, owing to the greater thickness at the root. The teeth of a rack may be straight when used with a pinion having Involute teeth.

When driving cogs into a mortise gear they should be coated with linseed oil or thin white lead, which will enable them to be put in tighter with less danger of splitting. A coating of hot tallow and plumbago or of linseed oil and plumbago administered to the cogs after they are driven into the wheel will greatly prolong their life.

Stress on Teeth.

The stress on wheel teeth may be due either to a dead load, or a load accompanied by vibration and even with impact. In the former the maximum load being a definitely known quantity, the tooth can be proportioned as a beam loaded at one end and fixed at the other, a definite factor of safety being aimed at. In the latter, the pressure on the teeth necessary to transmit the requisite horse power may be calculated, but a much larger factor of safety should be used to cover the effects of vibration and impact. The teeth may however be proportioned by empirical rules, but in using these, care must be taken that the wheel is also calculated to be strong enough for any dead load it may have to sustain, especially when the revolutions are low per unit of time.

When metal teeth work with metal teeth and are cast simply without being afterwards cut, it is quite possible that the load may come not only on a single tooth, but on one corner of it only. With machine cut teeth the load may be considered to bear evenly along the point of the tooth and not wholly on one corner; therefore if the teeth are carefully shaped on cycloidal principles the load may be considered as divided between two teeth, especially after a short time in use.

With mortise wheels, the teeth of which are always carefully dressed and shaped and tried round in place for final adjustment, the load may be considered distributed along the tooth point and likewise divided between two teeth at least. It is always safer to reckon the load as acting at the tooth point, instead of at the pitch circle when computing the strength. Ten may be considered a desirable factor of safety for ordinary purposes; but when there is vibration and impact it should be increased in some systematic way to suit each particular circumstance.

Cast iron teeth which work into mortise wheels should be carefully filed up to gauge and not only made approximately true in shape, but have all roughness removed to minimize excessive wear of the wood cogs.

To compute the dead load at pitch circle necessary to transmit the required power as in the case of a crane, the following rule may be found useful.

Maximum load at pitch circle in lbs.

$$= \frac{\text{I.H.P.} \times 33{,}000}{\text{pitch circle velocity in ft. per min.}}$$

Power of Gearing.

Pressure on the teeth of wheels varies inversely as the number of revolutions and directly as the power transmitted. Thus for equal power transmission by two wheels running at different velocities, say 20 and 80 revolutions per minute respectively, the strain on the former will be four times that of the latter. Again, if two wheels run at the same velocity, transmitting 20 and 40 horse power respectively, the strain on that delivering the higher power will be double that of the other. Power transmitted depends largely on the number of teeth in gear at one time and also on velocity.

Proportions of Wheel Teeth.

The following proportions are commonly adopted for the teeth of wheels when cast, and are stated in terms of the pitch:

Height of tooth above pitch line...	.33
Height of tooth below pitch line....	.42
Total height of tooth	.75
Working depth of tooth	.66
Thickness of tooth	.45
Space between teeth	.55
Backlash of tooth	.10
Thickness of wheel rim and arms...	.45

To ensure durability, the width of face of teeth should be $2\frac{1}{2}$ times the pitch.

With machine cut gears a different tooth proportion is followed:

Hgt. of tooth above pitch line..	.318
Hgt. of tooth below pitch line..	.369
Total height of tooth	.687
Working depth of tooth	.637
Thickness of tooth	.48 to .5
Space between teeth	.52 to .5
Backlash of tooth	.0 to .04

A TYPOGRAPHICAL ERROR.

The Magnolia Metal Company point out an error that was made in their April advertisement by the misplacement of a decimal, which has an important bearing upon the figures shown in the table under heading of "Coefficient of Friction"—"A" WHITE BRASS—in the test by the United States Government, using water as a lubricant. The figures under this heading should read as follows:—

Magnolia No. 1	0.00159375
Magnolia No. 2	0.0049479
"A" White Brass	0.0198916
Magnolia No. 1	0.00080208
Magnolia No. 1	0.00129166
Magnolia No. 1	0.0021727
Magnolia No. 1	0.00275

"Brain power in a factory counts for more than horsepower."

We strongly suspect that the coal evolved from ashes would necessarily be "chestnut' coal.

A magnetic chuck has been found useful in holding small parts of odd shapes which had to be repaired. It grips them without the use of special vises or jaws.

Gravity circulation in heating systems, it is said, will not in the great majority of installations exceed one foot per second, and in most of them is considerably less. Also that the friction of heated water in pipes is 25 per cent. less than with cold water, the two temperatures assumed being 170 and 60 degs.

* Part II of the third article of the series of Power Transmission Equipment, Operation and Efficiency Subjects.

BABBIT METALS.

By A. A. Greenburgh.*

THERE is perhaps, at the present time, no term in the mechanical world so ambiguous and so misused as the term "Genuine Babbitt." It is popularly believed that "Genuine Babbitt" is the composition originally compounded and invented by Isaac Babbitt, to whom we are indebted for the inventon of making soft metal linings for bearings. In U.S. Patent No. 1252, July 17, 1839, granted to him, a suitable composition is mentioned, consisting of 50 parts tin, 5 parts antimony and 1 part copper. Now what his patent specifically covers and what he claims in the same, is simply the method of application of a soft lining in bearings. The formula given was for the purpose of making his specifications complete for patent office requirements. The value of his invention in his own mind related to the construction of bearings rather than to the production of an anti-frictional metal.

Later, Mr. Babbitt gave the question of the composition of his alloy some thought, and he realized that the hardest alloy consistent with other requirements was the best for him to use. The formula for his favorite composition, which some years later he sold to a Mr. Phillips, an American manufacturer, was quite different from that first mentioned in his patent, in that it contained 10 parts tin, 1 part antimony and 1 part copper. At the outset, Mr, Babbitt himself had no exact composition which he used for his linings, wherefore the term "Genuine Babbitt" cannot be used in the sense that it is Babbitt's original composition; and further it is impracticable and cannot be used as a definite specification.

Babbitt Compositions.

Still greater uncertainty is brought out by chemical analysis of the different metals sold under the trade name of "Genuine Babbitt." If the term ever meant anything at all, it was simply this : that the preponderant constituent was tin, and that its two other constituents were antimony and copper.

Until recent years the term generally implied that the composition was free from lead. This however is no longer the case, because the low cost of antimonial-lead as a by-product for the last fifteen years, and the constant increase in the price of tin have weighed so heavily on the manufacturer of "Genuine Babbitt," that to-day the term no longer positively excludes lead from its composition.

* "Babbitt' specialist, the Lumen Bearing Co., Toronto and Buffalo.

Engineers and machine builders realize that there is no such thing as one universal bearing composition that can be considered as the best and most serviceable alloy for all requirements. Bearing metal should be specified with the same degree of care and decision as any other metal used in the construction of modern machines.

Manufacturers offer alloys of widely different compositions and it is impossible to rely upon fanciful labels and brands. While apparently there should be only one "genuine," there is no reason to believe that Isaac Babbitt's formula of fifty years ago, if taken as a definitely exact composition, should apply to the completely altered bearing conditions of to-day.

There is certainly a great question as to the adaptability of any one formula to the wide range of conditions which must be provided for in these days, so that there is justification for the intelligent manufacturer in departing from any established formula; such action is due to an increased knowledge of the metals and metallurgical processes and the necessity for economical construction.

As a matter of fact, nearly all bearing metal requirements could be met with Babbitt's composition of 10 parts tin, 1 part antimony and 1 part copper. The real merit of a bearing metal lies in its giving satisfactory service at a minimum first cost

The heating of bearings is the principal cause of annoyance, and in cases where the metal punishment is so severe that heating cannot be avoided, a metal of high melting point should be selected. The efficiency of the alloy, therefore, depends upon the quality of the wearing surface that can be produced and maintained under service. A properly selected metal carefully applied, both as to design and workmanship, produces a bearing which, with proper lubrication, has no metallic contact while running. That is, the journal and its bearing are separated from each other by a film of oil which is maintained in operation. As soon as the movement of the journal is stopped, the film of oil is gradually squeezed out and the metallic surfaces are brought into contact. Therefore in selecting the metals for a bearing they should be sufficiently dissimilar so that when starting the machine, there will be no danger of scoring the shaft until the oil film shall have been restored.

Manufacturing Methods.

Manufacturing methods have a very important bearing on the serviceability of different alloys. The chemical analysis of a Babbitt, giving the constituents and their relative proportions is of course of some value in determining the quality of Babbitt under consideration; but more important still are certain fundamental, chemical and metallurgical laws according to which the constituents should be united, and if these laws have not been observed, a very inferior product will be the result. It is not the purpose here to give a metallurgical treatise but to suggest ideas that should be observed in the handling and applying of lining metals.

In general, these metals should be melted in an iron vessel and kept covered as much as possible in order to prevent excessive oxidation. They should be heated considerably above their melting point before using, but must not be kept in a molten state at a high temperature longer than necessary. Overheating should be carefully avoided, and a good rule for general practice, is to heat the molten babbitt to a point where it chars a pine stick, at which temperature it casts perfectly.

Selection of Babbitt Mixture.

The analysis of service conditions is the first important step in the selection of the most economical Babbitt for any requirement. The variable conditions of applying a bearing, as well as the care, method and nature of lubrication, all have a distinct effect upon the final results.

Where the service conditions are severe, owing to great pressure, a metal having considerable compressive strength is necessary regardless of what the speed may be, and this condition would require a relatively high percentage of tin. Where there is high speed and the pressure light and moderate, a metal having a fairly high percentage of lead may be used. In the same manner with intermediate conditions between pressure and speed, correspondingly intermediate compositions can be selected.

The surroundings of a bearing should also be taken into consideration if they are at all unusual.

Care and Attention of Bearings.

The question of care and attention that a bearing receives should also be taken into consideration. A bearing that is lubricated at long intervals or with a poor grade of lubricant requires a higher grade of metal than that which would be required under more favorable conditions.

There is nothing very difficult in making Babbitt suitable to any kind of service. It is only necessary that the work be done by an experienced metallurgist. Right here is where we see the importance and value of dealing with a maker whose experience and reputation are above question and who produces alloys of high quality and sells them honestly at fair prices.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

SHIPPING AND RECEIVING PLATFORM.

By M. E. D.

A great deal of time is often lost by the shipping and receiving platforms being at an inconvenient height. For instance if there is no crane in a warehouse and the platform is too low, a great deal of time is consumed in pushing materials up an incline or hoisting them in some way by manual labor.

Where a factory is already established a shipping platform can sometimes be arranged at convenient height at a low cost, but more often it will be found expensive. In erecting a new plant, however, this question should receive full consideration and the platforms arranged at the most convenient height. Not only does this question of convenient height apply to shipping and receiving by car but by team as well.

Another point is the location of the platforms. Adverse weather conditions often interfere with easy shipments and it is rather inconvenient to unload a car in the rain or in a snow storm. This is often the case in the smaller plants. The solution of this difficulty in small plants is to extend the warehouse roof over the shipping or receiving platform and this can be done at a comparatively small cost in established plants. In larger plants, depressed tracks can be laid into the warehouse, and therefore under cover, the floor of the warehouse and cars being on a level. These ideas are now incorporated in the design of a number of Canadian plants and are found to facilitate greatly the handling of materials.

RESPONSIBILITY OF MANUFACTURERS FOR TRAINING OF SKILLED MECHANICS AND SHOP FOREMEN*

By Arthur L. Williston.**

The need for an efficient way of obtaining more skilled mechanics and competent shop-foremen is everywhere apparent, said Mr. Williston. For a long time, in America, we have taken pride in the idea that we were a practical people, but we have recently been brought to realize that in several most important particulars we have been surprisingly shortsighted; we have been wasteful of forests, have exhausted the natural fertility of the soil, and have drawn upon the mineral resources of the country with little heed for the future; and now we are beginning to understand that we have been more wasteful of the undeveloped power in human beings, even than in the use of any other natural resources.

Full-time day trade schools, equipped with all the necessary tools and appliances for thoroughly practical work, and manned by efficient teachers, offer an ideal opportunity for teaching a trade and cultivating skill, intelligence, and the spirit of devotion to work. The boy's full time can be devoted to studying principles and conditions and to applying in practical ways all that he has learned. He is not at any time serving two masters, and his whole interest and energy may be concentrated in the most effective way, on these things that most help toward his greatest possible development. On the other hand, the possibility of getting any large proportion of the boys who are to enter any given trade or calling to make the necessary sacrifice of earning power in order to attend a day school, presents a very serious problem. No boy of the type of those who enter mechanical trades for a livelihood can attend a long course, no matter how great he may consider the advantages; and only those who are more persevering than the average, or who are especially favored can attend a short course. The day trade school, therefore, can best reach those of exceptional ambition who desire to become superior workmen, foremen, etc.

Data Regarding Results of Trade School Instruction.

Reliable statistics showing the exact value of the training received in a given time in each of the types of schools described are very difficult to secure and necessarily quite incomplete, but enough facts are available to demonstrate beyond a reasonable doubt that efficient trade school instruction will give an increase in earning power, both to the individual and for the employer, that could not possibly be obtained through practical experience alone.

The type of boys who enter skilled trades and mechanical occupations, by the time they arrive at an age where they can be taught trades effectively, already have an earning power which they and their families are loath to give up. As a rule it would be possible for them to do this for a year or for two years if they were absolutely convinced that the return in future advancement would be sufficient, but the evidence naturally has to be very plain and convincing. The essential thing, therefore, for the more rapid growth of the movement for the extension of industrial education is more effective methods for bringing before the boys who are about to enter industry, sufficiently convincing testimony of the value of making themselves competent in their calling in order to overcome their natural desire for an immediate change.

There is but one group of persons in the community who can effectively do this. They are the employers. I am convinced that they are responsible for a great deal of the misinformation and many of the wrong ideas that cause boys at the present time to decide questions of this kind unwisely. Their methods of rejecting applicants or of giving employment have a more far-reaching influence than many realize. I recall that, in one investigation that I made, I found that 96 p.c. of all the pupils enrolled in a very large evening class in mechanical drawing were there because a comparatively few employers had adopted the plan advising all young applicants for positions in their works to make themselves competent before they applied again, and suggesting an evening course in mechanical drawing as a means of doing so if they could not already readily read blue prints. If all employers were to carry out this policy as effectively as the small group that I have referred to, the difficulties would be largely overcome.

JIB CRANES SAVE TIME.

The value of jib cranes as time savers is being recognized in a large number of Canadian shops. It is not always possible to have the main crane to lift large castings or steel shapes on or off a machine and in many cases the jib crane has been installed.

The advantages are that it is always ready for use and convenient, the operator can quickly remove a large casting from his machine and replace it with another, without loss of time. The addition of block and tackle further facilitates the quick handling of work and increases the value of jib cranes in a shop.

* Abstract of paper presented before the Congress of Technology at the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology.

** Principal of Wentworth Institute, Boston, Mass.

CLEAN VS. DIRTY SHOPS.

A man's surroundings react upon his ideals, mode of thought, and ways of working. The workman who comes from a slovenly home where meals are badly cooked, the house in a litter and things generally in a disordered state, will, in the natural order of things, be a slack and unsatisfactory workman. His moral stamina will be low and his ambition listless. The best workmen, generally, are those having cheerful homes, good wives and happy children. They have something to live for and work for—ambition to some day, perhaps, hold a position of responsibility.

Granted that this is true, why should a manufacturer require his workmen to work in a dirty, ill-kept shop—where old waste and oil slip under a man's feet as he walks, and where the machines are coated with grease that never has been cleaned off since they were bought?

Cleanliness costs, and so does almost everything that is worth while; but it pays in the long run. It pays in the effect on the men, in tending to raise the standard of workmanship, in elevating moral standards, in reducing fire risk, and in saving machinery from abuse. By all means cleanliness pays, and the dirty shop is always a reproach to the management.—Machinery.

FACTORY SANITATION AND EFFICIENCY.*

By C. E. A. Winslow.**

The great economic importance of good air, or proper temperature and humidity in factories, was presented very forcefully by Professor C. E. A. Winslow, of the College of New York. Professor Winslow pointed out in the beginning of his paper the fact that humidity and temperature conditions in factories though they profoundly affect the efficiency of the workmen, have received very little attention from the manufacturer himself, and this little almost wholly under the compulsion of State laws. For the moment, said Professor Winslow, I am quite frankly and coldly treating the operative as a factor in production whose efficiency should be raised to the highest pitch, for his own sake, for that of his employer, and for the welfare of the community at large.

The intimate relation between the conditions which surround the living machine and its efficiency is matter of common experience with us all. Contrast your feelings and your effectiveness on a close, hot muggy day in August and on a cool brisk bright October morning. Many a factory operative is kept at the August level by an August atmosphere all through the winter months. He works listlessly, he half accomplishes his task, he breaks and wastes the property and the material entrusted to his care. If he works by the day the loss to the employer is direct; if he works by the piece the burden of interest on extra machinery has just as truly to be borne. At the close of the day the operative passes from an overcrowded, overheated workroom into the chill night air. His vitality lowered by the atmosphere in which he has lived, he falls a prey to minor illness, cold and grip and the disturbing effect of absences is added to inefficiency. Back of it all lurks tuberculosis, the great social and industrial disease which lays its heavy death tax upon the whole community after the industry has borne its more direct penalty of subnormal vitality and actual illness.

The remedy for all this is not simply ventilation in the ordinary sense in which we have come to understand the term. Conditioning of the air so that the human machine may work under the most favorable conditions,—this is one of the chief elements of industrial efficiency as it is of individual health and happiness.

The chief factors in air conditioning for the living machine, the factors which in most cases far outweigh all others put together, are the temperature and humidity of the air. Heat, and particularly heat combined with excessive humidity, is the one condition in air that has been proved beyond a doubt to be universally a cause of discomfort, inefficiency and disease. Flugge and his pupils in Germany and Haldane in England have shown that when the temperature rises to 80 deg. with moderate humidity or much above 70 deg. with high humidity depression, headache, dizziness and other symptoms associated with badly ventilated rooms begin to manifest themselves. At 78 deg. with saturated air Haldane found that the temperature of the body itself began to rise. The wonderful heat-regulating mechanism which enables us to adjust ourselves to our environment had broken down and an actual state of fever had set in. Overheating and excess of moisture is the very worst condition existing in the atmosphere and the very commonest.

The importance of the chemical impurities in the air has dwindled rapidly with the investigations of recent years. It was long believed that the carbon dioxide was an index of some subtle and mysterious "crowd poison" or "morbific matter." All attempts to prove the existence of such poisons have incontinently failed. Careful laboratory experiments have quite failed to demonstrate any unfavorable effects from rebreathed air if the surrounding temperature is kept at a proper level. In exhaustive experiment by Benedict and Milner (Bulletin 136, Office of Experiment Station, U. S. Department of Agriculture), 17 different subjects were kept for periods varying from three hours to thirteen days in a small chamber with a capacity of 197.6 cubic feet in which the air was changed only slowly while the temperature was kept down from outside. The amount of carbon dioxide was usually over 35 parts (or eight to nine times the normal) and during the day when the subject was active it was over 100 parts and at one time it reached 231 parts. Yet there was no perceptible injurious effect.

The main point in air conditions is then the maintenance of a low temperature and of a humidity not too excessive. For maximum efficiency the temperature should never pass 70 deg. F., and the humidity should never be above 70 per cent. of saturation. At the same time a too low humidity should also be avoided. We have little exact information upon this point, but it is a matter of common knowledge with many persons that very dry air, especially at 70 deg. or over, is excessively stimulating and produces nervousness and discomfort. It would probably be desirable to keep the relative humidity between 60 and 70 p.c.

Another point which may be emphasized in the light of current opinion is the importance of "perflation" or the flushing out of a room at intervals with vigorous drafts of fresh cool air. Where there are no air currents the hot, moist, vitiated air from the body clings round us like an "aerial blanket," as Professor Sedgwick calls it, and each of us is surrounded by a zone of concentrated discomfort. The delightful sensation of walking or riding against the wind is largely perhaps due to the dispersion of this foul envelope and it is important that a fresh blast of air should sometimes blow over the body in order to produce a similar effect. The same process will scatter the odors which have been noted as unpleasant and to some persons potentially injurious. The principal value of the carbon dioxide test to-day lies in the fact that under ordinary conditions high carbon dioxide indicates that there are no air currents changing the atmosphere about the bodies of the occupants.

There is plenty of evidence, though of a scattered and ill digested sort, that the elimination of such conditions as these brings a direct return in increased efficiency of production.

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* Abstract of paper presented before the Congress of Technology at the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology.

** Associate Professor of Biology, College of New York, and Curator of Public Health, American Museum of Natural History, New York.

The Annual Convention of Foundrymen at Pittsburg

Plans Made for the Conventions of the Allied Foundry Associations and the Exhibit of The Foundry and Machine Exhibition Co., the Companies Exhibiting and the Equipment That Will be Shown.—It is Expected That the Attendance Will Surpass Any Previous Exhibition.

PREPARATIONS are being completed to make the Foundrymen's Convention better than any previous one. For several months the Pittsburg committees have been at work and a large attendance is assured. The allied



DR. RICHARD MOLDENKE, Watchung, N.J.
Secretary A. F. A.

foundry associations including the American Foundrymen's Association, The American Brass Founders' Association and the Associated Foundry Foremen will meet in convention, and at the same time, May 23 to June 1, the great exhibit of the Foundry and Machine Exhibition Co. will be held and the latter feature will be the most extensive in the history of the Conventions. The buildings of the Western Pennsylvania Exhibition Society, at the junction of the Allegheny, Monangahela and Ohio rivers, have been secured and over 40,000 square feet have been contracted for by manufacturers.



W. M. CORSE, Buffalo.
Secretary A. B. F. A.

The Pittsburg committee in charge of the work consists of Joseph T. Speer, president of the A.F.A., chairman; F. W. Zimmers, secretary; J. S. Seamen, chairman of finance committee; H. E. Field, chairman of convention committee; W. A. Bole, chairman of the plant visitation committee; George P. Bassett, Jr., chairman of the ladies entertainment committee; E. D. Frohman, chairman of the ball game committee; Eliot A. Kebler, chairman of the reception committee and W. B. Robinson, chairman of the press committee.



JOSEPH T. SPEER, Pittsburg,
President A. F. A.

Registration.

Registration will commence on May 22 at the Exposition Buildings when delegates or visitors are requested to follow the following instructions:

The registration committees wish to advise association members that the registration at the Pittsburgh Convention will be conducted in much the same manner as last year at Detroit.

To expedite the registration and facilitate the work at the counter, they make the following requests:

First—That each person registering will do so according to the name in which the membership stands, for instance, if John Jones is representing John Brown & Co., who are members of the A. F. A. or A. B. F. A., he will go to the alphabetical division "B," where he will present his card saying John Brown & Company are members of either or both associations, and he



N. K. B. PATCH, Toronto, Ont.
President A. B. F. A.



ROBERT B. THOMPSON, Buffalo.
President A. F. F.

will register as John Jones of John Brown & Co.

The members of the Associated Foundry Foremen will of course register individually, under the proper alphabetical division.

Second—It is also requested, when convenient that those registering will pre-



GEO. RAYNOR, Niagara Falls, N.Y.
President F. & M. Exhibition Co.

sent their business card, bearing their own name and firm name, thus making sure that the names will be recorded correctly.

With these advance hints it is hoped to make the registration an ideal one for all concerned.

A.F.A. Officers.

President, Joseph T. Speer, Pittsburg Valve, Foundry & Construction Co., Box 1016, Pittsburg, Pa.

Vice-Pres., (first district)—F. B. Farnsworth, New Haven, Conn.



HARRY D. GATES, New York.
Vice-Pres. F. & M. Exhibition Co.

Vice-Pres. (second district — Walter Wood, Philadelphia, Pa.

Vice-Pres. (third district)—W. A. Bole, E. Pittsburg, Pa.

Vice Pres. (fourth district)—William Gilbert, Cincinnati, Ohio.

Vice-Pres. (fifth district)—J. J. Wilson, Detroit, Mich.

Vice-Pres. (sixth district)—T. W. Sheriff, Milwaukee, Wis.

Vice-Pres. (seventh district)—Alfred E. Howell, Nashville, Tenn.

Vice-Pres. (eighth district)—A. N. W. Clare, Preston, Ont.

Sec.-Treas.—Richard Moldenke, Watchung, N. J.

A.F.A. Committees.

Auditing—Wm. Yagle and H. E. Field.

Metallurgy—H. E. Diller.

Papers—H. E. Field, chairman, L. L. Anthes, Ellsworth M. Taylor and A. O. Backert.

Industrial Education—P. Kreuzpointer.

A.B.F.A. Officers.

President—N. K. B. Patch, Toronto.

Secretary-treasurer—W. M. Corse, Buffalo.



T. S. HAMMOND, Harvey, Ill.
Vice-Pres. F. & M. Exhibition Co.

Vice-Presidents—Thos. Evans, Philadelphia; J. C. Sharpe, Chattanooga; W. L. Abate, New York; W. H. Carpenter, Bistol; Richard Augenbraun, Standford; L. M. Olson, Mansfield; John Wollf, Chicago; J. N. Gamble, Kewanee, Ill.; and Richard R. Mitchell, Montreal.

Convention Programme.

On Tuesday, May 23, a joint session of the associations will be held when papers will be read on "Production Cost," "Economic Foundry Insurance" and "Uniform Contracts." In the afternoon separate sessions will be held and in the evening the exposition will be open for delegates.

On the evening of May 24 will be the dinner of the Pittsburg and Associated Foundry Foremen. On the afternoon of May 25 will be the ball game between the Pittsburg and Cincinnati clubs of the National League.



WILFRED LEWIS, Philadelphia.
Vice-Pres. F. & M. Exhibition Co.

Besides the many special features of the program there will be the added attraction of visiting Pittsburg foundries, complete arrangements having been made for the visitors to inspect them.

Papers to be Read.

The following papers will be read before the A. F. A.:

"Economical Insurance for Foundry Properties," by S. G. Walker, Providence, R.I.
"Foundry Construction," by Geo. K. Hooper, New York City.
"Vanadium Iron and Steel Castings," by G. L. Norris, Pittsburg.



C. E. HOYT, Chicago.
Secretary F. & M. Exhibition Co.

"The Foundry at Close Range," by Benj D Fuller Cleveland

"The Permanent Mold," by Edgar A Custer Philadelphia

"Titanium in Iron and Steel Castings," by Chas V Slocum Pittsburg

"Production Costs," by Ellsworth M Taylor New York City

"The Manufacture and Annealing of Converter Steel Castings," by Bradley Stoughton, New York City

"The Electric Steel Furnace for Steel Castings," by Dr P Heroult New York City

"Titanium in Malleable" by C H Gale Pittsburg.

"The Practicability of the Induction Furnace for the Making of Steel Castings," by C H Vom Ruu, New York City

"The Rotary Blower for Cupola Use," by R H Roe Schenectady N.Y.

"Open-Hearth Steel Foundry Practice," by R A Bull, Granite City, Ill

"Pattern Shop Apprentice," by Jabez Nall, Cleveland.

"The Application of Lifting Magnets to Foundry Work," by A C Eastwood, Cleveland

"Electric Motor Drive for Foundries," by Brent Wiley Pittsburg

"The Steel Open Hearth Furnace for Steel Castings" by Walter MacGregor, Chicago.

"Microscopic Structure of Iron and Steel," by Prof Wm Campbell, New York City.

"Manganese and Silicon in the Foundry," by A E. Outerbridge, Jr., Philadelphia.

"Gas Cavities Shot and Chilled Iron in Iron Castings," by Thos. D. West, Cleveland.

"Coremaking and Core Machines," by Arch. M Landon, Elmira, N.Y.

"Molding Machine Practice," by E. H. Mumford, New York City.

"Machine versus Hand Molding," by John Alexander, Philadelphia.

"Defective Castings and How to Handle Them," by John M Perkins, Detroit.

"Core Room Practice," by F. A. Coleman, Cleveland.

"Cupola Melting Practice," by P. Munnoch, New York City.

"Malleable Castings," by W. P. Putman, Detroit.

"The Equipment of Air Furnace Using Oil as Fuel," by N. W. Best, New York City.

"Instruction Paper on Phosphorus in Cast Iron," by R. E Field, Pittsburg.

"Mechanical Charging of Cupolas," by G. R Brandon, Harvey, Ill.

"Pattern Equipment," by W. S. Giele, Philadelphia.

"Recovery of Foundry Waste," by S. A. Capron Westfield, Mass.

"Cupola Practice," by R. H. Palmer, Salem, O.

"The Foundry Foremen's Educational Movement," by D. O. Wilson, Newark, N.J.

"The Briquetting of Metal Borings and Turnings," by Dr. R. Moldenke, Watchung, N.J

Presentation of data on the molding sand tests of the American Foundrymen's Association.

Memorandum on the standard test for cast iron.

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The following is a partial list of papers to be read before the A B F A.:

"Alloys," by Dr W. R. Whitney.

"Corrosion of Brass Foundry Products," by Wm Vaughn of A. D. Little, Inc.

"The Pouring and Melting Points of some High Grade Bronzes," by C P. Karr.

"Annealing and its Non-Ferrous Alloys," by W C Lane.

"The Pyrometer and the Aluminum Foundry" by H W Gillett

"Non Ferrous Foundry Economics Refinements" by E A Barnes

"Determination of Nickel in Alloys," by S. W Parr.

"Equilibrium Diagram," by H W Gillett

A.S.M.E. Meeting.

A feature of interest at the meeting of the American Society of Mechanical Engineers during the second week of the Exhibit. Engineers attending the A S M E meetings, therefore, will have an opportunity of inspecting the exhibits and exhibitors will have an opportunity of attending the A S M E meetings

Exhibitors and Exhibits.

Some conception of the exhibit may be obtained from the following list of exhibitors and the equipment that each company will show. This list is only partial as replies were not received in time for publication, from a large number of other manufacturers who will be represented.

Exhibitors and Their Exhibits.

The Adams Co., Dubuque, Iowa.—Various sizes of Farwell squeezers, a few of the 72 styles of molding machines. Demonstrations will be made of the squeezers with a variety of patterns.

J. B. Wise, Watertown, N.Y.—One each of Nos. 150, 250, and 440 M.R.V. furnace.

Sand Mixing Machine Co., N.Y.—Auto Sand Mixer, a self propelled machine for cutting molding sand and for mixing core sands and facing sands. Representatives: William A. Heartt, Hutton H. Haley, John Bradley, B. F. Doup and V. E. Minich.

Herman Pneumatic Machine Co., Zelienople, Pa.—Four Herman jarring molding machines: One 24x30 inch. Herman jarr ram stripping plate machine, wherein the mold is rammed by the jarring process and the pattern drawn by same machine for the use of side lifting cylinders that engage the stripping plate and strip the mold off the pattern; two 30x45 in. Herman jarring molding machines, equipped with rollover and pattern drawing device, made especially for the purpose of making lavatories; and one 60x60 inch. Herman jarring molding machine, to be used for jarring purposes only, (commonly called bumper). This machine will simply ram the mold and be rolled over by the use of a crane and the pattern drawn by hand in the usual manner. An overhead tramway and trolley will be exhibited. Representatives: A. M. Frauenheim, M. L. Heyl, Charles Herman, Alfred Herman, Andrew Rodgers and C. E. Pettee.

Arcade Mfg. Co., Freeport, Ill. — Arcade molding machines in operation; Norcross jarring machine, 3-cylinder type; Norcross jarring machine, single cylinder type; Norcross core jolt machine; modern molding machine in three types; Arcade rotary sand sifters; Arcade squeezer; perfect match plate hinge; modern automatic power molding machine, with sand elevator and dropper. Representatives: E. H. Morgan, Chas. Morgan, L. L. Munn, F. N. Perkins, R. M. Burton, W. C. Norcross.

Goldschmidt Thermit Co., New York.—Will show full line of metals produced free from carbon, including: Chromium 97-98 per cent., manganese 97-98 per cent., ferro titanium 20-25 per cent. Ti., ferro vanadium 30-35 per cent. V., manganese titanium 30-35 per cent. Ti., manganese copper 30-70 per cent., manganese tin 50-50 per cent., manganese zinc 20-80 per cent., ferro molybdenum 80 per cent. molybdenum, ferro boren 20-25 per cent. boron. In addition to these metals will be shown heating Thermit cans for reviving dull iron in the ladle, making semi-steel, keeping risers of castings liquid and preventing piping in steel ingots; Titanium Thermit cans for purifying molten iron and increasing its fluidity and enabling the production of castings of higher quality and greater density. Demonstrations will be given showing the value of the Thermit process for welding and repairing castings and forgings, and a number of specimen welds will be on exhibition. A complete line of welding appliances will also be shown with photographs of important repairs. Representatives: William C. Cuntz, E. A. Beck, H. S. Mann and William R. Hulbert.

Tabor Mfg. Co., Philadelphia—Plain power squeezers, power squeezing split pattern machines, hand roll-over machines, power roll-over machines, shockless jarring machine, combined shockless jarring and roll-over machines, jarring, squeezing roll-over machines, Taylor-Newbold saws, Taylor-Newbold milling cutters and Taylor Universal tool grinder. The molding machine portion will be in operation. Representatives: Wilfred Lewis, H. W. Brown, John T. Ramsden, C. W. Coleman, J. H. Coleman, C. H. Ellis and Glen B. Hastings, John Pfender Dudley, Willcox, H. W. Impey and D. J. Martin.

William Sellers & Co., Philadelphia—Centrifugal belt driven sand mixing machine, centrifugal motor driven sand mixing machine, motor driven drill grinding machine, motor driven universal tool grinding and shaping machine.

Ingersoll-Rand Co., New York—Air compressors, pneumatic chipping hammers, sand hammers for bench and floor work, riveting hammers, piston and rotary drills, motor hoists and stationary motors. Representatives: W. H. Armstrong, W. A. Armstrong, E. P. Mooney, W. B. Brendlinger, H. E. Metcalfe and J. S. Kelly.

Gardner Machine Co., Beloit, Wis.—A double-head patternmaker's disc grinder in operation, a No. 14 combination metal grinder, a No. 2 special equipped disc grinder, a No. 6 machine with ring wheel chucks and cup wheels and a No. 11 Band polishing machine.

National Core Oil Co., Buffalo—Various oils manufactured and cores made from them. Representatives: C. H. Cotton, P. L. Crandall, C. M. Anderson, J. J. McCarty and B. J. Cummins.

International Molding Machine Co., Chicago Small and large stripping plate machines, turn-over draw machines, core-making machines and squeezers. Representatives: Edward A. Pridmore, W. W. Miller and J. W. Dopp.

Lawlor Improved Jarring Molding Machine Co., Pittsburg—There will be shown a 54x64 in. Lawlor improved jarring machine, bumper, and a portable combined jarring and squeezing machine, with 13x38 in. table plate for a 37-in. radiator pattern.

Jonathan Bartley Crucible Co., Trenton, N. J.—Different sizes of crucibles, including special crucibles, retorts, phosphorizers, stoppers, etc. Representatives: Samuel H. Dougherty, Lee T. Ward, Herbert D. Cole and Lewis H. Lawton.

Morner & Smith, Dayton, Ohio—Aluminum snap flasks. Representatives: Louis Morner and Chas. D. Smith.

Detroit Core Machine Co., Detroit—Detroit core machines, which are foot-power, jar-ramming, roll-over machines, adapted to small and medium-sized irregular cores.

Hawley Down Draft Furnace Co., Chicago—Will have on exhibit a miniature iron foundry.

Chicago Pneumatic Tool Co., Chicago—Pneumatic sand rammers and sifters, chipping hammers, a pneumatic hoist and electric grinder. Air will be furnished by a Franklin compound belt-driven air compressor.

Brown Specialty Machinery Co., Chicago—Standard hammer core machine and style "C" hammer core machine, with cutting-off and tapering machines. Representatives:—Elmer A. Rich, Jr., and John Laycock.

Joseph Dixon Crucible Co., Jersey City—Crucibles and graphite products. Representatives: Dudley A. Johnson, F. R. Brandon, John A. Condit and Frank Krug.

Albany Sand & Supply Co., Albany, N.Y.—Booth will be arranged as rest room and office.

S. Obermayer Co., Cincinnati, Ohio—Rest room with catalogues, in charge of E. D. Frohman.

Gardner Printing Co., Cleveland.

Oliver Machinery Co., Grand Rapids, Mich.—Will exhibit a complete line of pattern-making and flask-making machinery in operation, and will consist of No. 60 Universal saw bench, No. 90 Universal saw bench, No. 16 band saw, No. 17 band saw, No. 12A hand jointer, No. 14B hand jointer, No. 144C hand jointer, No. 61A surface planer, No. 99B surface planer, No. 24R wood lathe, No. 19F speed lathe, No. 128 patternmakers' bench, No. 481 Universal tool grinder, No. 482 Universal tool grinder, No. 53B speed lathe, No. 55B speed lathe, No. 56A speed lathe, No. 41A disc sander, No. 30 vertical spindle and disc sander, No. 72A vertical spindle borer, No. 0 wood trimmer, No. 7 wood trimmer, No. 3 wood trimmer, No. 9A wood trimmer. A special exhibit will be made of No. 102 new style Oliver Universal wood milling machine for making irregular shapes. Representatives: Joseph W. Oliver, A. N. Spencer, Geo. F. Reinhard, A. S. Kurkjian, Walter Mentzer, Arthur Blake and R. A. Smith.

Canadian Foundryman, Toronto—Represented by H. V. Tyrrell and Peter Bain.

Berkshire Mfg. Co., Cleveland, Ohio—Hand squeezing and pattern drawing molding machine, plain squeezers and automatic molding machines, also a full line of snap flasks, iron flasks, etc. Representatives: R. H. York, J. N. Battenfeld, C. F. Battenfeld, salesman and demonstrators.

Metal Industry, New York.

Standard Linseed Co., Cincinnati, Ohio—Standard foundry linseed oil for core-making purposes.

Superior Sand Co., Cleveland, Ohio—Samples of all grades of molding sand for the production of heavy machinery, car wheels, ingot molds, heavy malleable, medium and light malleable and grey iron, brass and aluminum castings, including No. 5 Rodgers molding sand for production of grey iron, malleable or semi-steel. Representatives: W. H. Smith and H. C. Krontz.

Henry E. Pridmore, Chicago—Stripping plate machines, rock-over drop machines and their new electric motor-driven jarring mach-

ine. Representatives: R. E. Turnbull, D. F. Eagan, A. V. Magnuson and Henry A. Pridmore.

Burrows Adding Machine Co., Detroit—Cost machine will be shown which is arranged to print and add simultaneously workman's number, number of hours' work and wage due. Eight or ten different machines will be on exhibit and the booth will be in charge of Ward Ganete and H. F. Happer.

Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.—One traveling crane trolley, one travelling crane cage complete with controllers, one back-geared electric motor, and one caged controlled electric monorail hoist.

Hauck Mfg. Co., New York—Will exhibit a complete line of oil burning appliances, particularly of portable type, including cupola lighters, ladle heaters, core oven and furnace burners, mold driers, pre-heating and brazing outfits, all of which will be shown in operation. Representatives: A. E. Hauck, A. P. Link, A. H. Stein and H. E. Giersch.

Sterling Wheelbarrow Co., West Allis, Wis.—Foundry flasks.

Buckeye Products Co., Cincinnati.—Exhibit will cover their complete line of supplies. They will demonstrate their special products such as Buckeye parting, brass flux, Linco core compound, Buckeye binder and blacking. Representatives: Charles J. Goehringer, Edward Leisl and travelling representatives.

A. Buch's Sons Co., Elizabethtown.—Three combination jar and squeezer molding machines; patented aluminum snap flasks, square and tapered; patented steel flask bars; Buch's pattern cement; bottom boards; cast iron casings, cast iron flasks for gravity machine with bottom boards and bars; special pouring ladle; patterns, castings, etc. Representatives: R. S. Buch and Geo. E. Bates.

T. J. Peterson Co., Chicago—Cores made from Peterson Company's oils in different foundries. Five demonstrators will show the use of oil in sand for making cores.

J. W. Paxsom Co., Philadelphia—Will have a full line of photographs, blue prints, catalogues, etc. A number of representatives will be present.

J. S. McCormick Ca., Pittsburg, Pa.—Two McCormick continuous sand mixers with screens, one Perfection electro-magnetic separator and general foundry facings and supplies. Representatives: J. S. McCormick, T. E. Malone, S. R. Costley and R. H. Mills.

Tate, Jones & Co., Pittsburg—Stationary brass melting furnaces; No. 0 pumping, heating and regulating system; oil burners for mold drying, cupola lighting and ladle drying.

E. Killing's Molding Machine Works, Davenport, Iowa.—Stripping plate machine, rollover machine, multiple cylinder plain jarring machine, jarring rollover (two sizes) machine and automatic squeezer. Representatives: E. Killing, A. W. Fox, C. P. Axbye and Geo. Heck.

Carborundum Co., Niagara Falls, N.Y.—Carborundum and Aloxite grinding wheels, Carborundum fire sand and rubbing bricks. Wheels will be shown under actual working conditions. Representatives: Geo. R. Rayner, W. W. Sanderson, O. C. Dobson, Anthony Dobson, J. P. McCann, C. D. Sargent, and H. A. Eaton.

Standard Sand Machine Co., Cleveland.—One of their latest improved batch mixers with side drop clean out doors and revolving screen, No. 1 rolling and sand blending machine; and a No. 4 proportioning, screening, mixing, rolling and bonding plant for steel foundries, weight over 11 tons.

Penton Publishing Co., Cleveland.

W. W. Sly Mfg. Co., Cleveland, Ohio—A miniature set-up of cleaning mills, cinder mill and dust arrester in running order, and also sand blast machinery. Representatives: W. W. Sly, W. C. Sly, G. J. Fanner, H. J. Norris and H. R. Morse.

Detroit Foundry Supply Co., Detroit, Mich.—Booth will be fitted as a rest room. Representatives: H. Bruce Howard and M. Z. Fox.

Detroit Hoist & Machine Co., Detroit—Pneumatic geared hoists, pneumatic motors and pneumatic winches.

Hanna Engineering Works, Chicago—Rathbone multiple molding machine, Hanna pneumatic shakers, revolving pumping riddle, mold dryer, Hanna riddle oscillator, riveter, vibrators, blow guns, etc.

Pickands, Brown & Co., Chicago—Exhibit will consist of a display of Solvay coke arranged to show a portion of a bungalow or cottage. Representatives: B. T. Bacon, E. A. Bateman, C. N. Turner, G. A. T. Long and J. A. Galligan.

Mumford Molding Machine Co., Plainfield, N. J.—Split pattern power ramming machine with vibrator, plain squeezer with match plate roll-over mechanism, 10-in. high trunnion squeezer with match plate and vibrator, 10-in. plain jolt ramming machine with new style valve, 3-in. plain jolt ramming machine also with new style valve and sections of this machine showing in full detail this new valve arrangement.

The Cleveland Pneumatic Tool Co., Cleveland, O.—A line of sand rammers, riveting and chipping hammers, air drills, all sizes, emery grinders, Bowes air rose couplings, etc. The various tools will be shown in operation. Representatives: H. S. Covey, sales manager; Arthur Scott, superintendent, and J. T. Graves, salesman.

The Osborn Manufacturing Co., Cleveland, O.—Plain jolt molding machines, no-lift core jarring machines, roll-over rock-down molding machines, direct draw roll-over molding machines, rock-over molding machines, flask stripping machines, stripping plate machines, drop plate squeezing machines, mechanical pattern drawing device. The latter apparatus is for drawing patterns of large size from molds placed on the floor, and is a portable machine adapted to use on various sizes of flasks with patterns of from 6 to 15 inches depth.

The following companies will also exhibit: American Vandium Co., Pittsburg; Birkenstein & Sons, Chicago; Elmira Foundry Co., Elmira, N.Y.; Harbison-Walker Refractories Co., Pittsburg; Hill & Griffith, Cincinnati; Interstate Sand Co., Zanesville; Lupton's Sons Co., Philadelphia; Ohio Sand Co., Conneant; Osborn Mfg. Co., Cleveland; Robinson Auto Machine Co., Detroit; Rockwell Furnace Co., New York; Ross-Tacony Crucible Co., Philadelphia; Frederic B. Stevens, Detroit; U. S. Graphite Co., Saginaw; Wadsworth Core Machine & Equipment Co., Cayahoga Falls; Whiting Foundry Equipment Co., Harvey, and Williams-Davis Co., New York.

TRADE GOSSIP.

The Galt Brass Co., Galt, are enlarging their plant.

George White & Sons, London, recently completed a new foundry at a cost of $20,000.

R. McDougall, Galt, have let the contract to Wm. Edmonds for a new molding shop.

The Anthes Foundry Co., Toronto, have purchased a site in Winnipeg, and will erect a foundry.

It is stated that the Atikokan Iron Co., Port Arthur, intend erecting a foundry for the manufacture of pipe.

Edward Gurney, president of the Gurney Foundry Co., Toronto, is touring Europe. He will be absent about six months.

The Canadian Westinghouse Co., Hamilton, are planning to double the capacity of their foundry. Additional cupolas and core ovens will be installed.

S. Twist, until recently associated with the Gurney Foundry Co., Toronto, is now mechanical superintendent of the foundry of the Dominion Stove and Foundry Co., Penetang, Ont.

Reginald Redden, who has been employed for some time with the Lloyd Foundry Co., Kentville, N.S., has taken a position with the Scotia Foundry Co., Halifax.

The Welland Machine and Foundries Ltd., have been awarded the contract to supply 150 tons of gray iron castings for the construction of the Page-Hersey Works.

The Ontario Gazette contains notice of the increase in the capital stock of the National Iron Works, from $200,000 to $1,000,000, by the issue of eight thousand shares of new stock of $100 each.

Somerville Ltd., and the General Brass Mfg. Co., Toronto, have merged their interests under the title United Brass & Lead Co., with a capital of $500,000. The promoters are: Alex. F. Fuller, Chatham; Fred Somerville, Toronto; Murray James, Woodbridge; Lorne M. Somerville and Andrew J. Somerville, Toronto.

Edward A. Pridmore, W. W. Miller and D. C. Snow, of Chicago, designers and manufacturers of the "International" molding machines, and who have been doing business temporarily under the name of the Edward A. Pridmore Co., have adopted the International Molding Machine Co. as their permanent name. J. W. Dopp, who is well known among the foundry trade in the Central States, having been western sales manager for the Tabor Mfg. Co., about six years, has been appointed general sales manager by the International Molding Machine Co. Previous to his connectian with the Tabor Mfg. Co., Mr. Dopp had charge of the molding machine departments of several of the largest foundries in the country, among them being the Cambridge, Mass. plant of the International Steam Pump Co.

On April 27th the workshops of the Canada Car and Foundry Company were the scene of the most disastrous fire that has visited Amherst for years. The origin of the fire is a mystery. The flames spread from the forge shop to the grey iron foundry, to the machine shop, to the blacksmith shop, to the brass foundry and to the store rooms of the bolt and forge departments. All these buildings were soon a mass of flames, and nothing remains of them but blackened walls and twisted iron rods and wheels. The two erecting shops, the axle and wheel shops, rolling mills and malleable iron works and original wood-working plant of the old Rhodes-Curry Company were not touched by the flames. In fact fullv seven-eighths of the plant escaped damage. The loss will be in the vicinity of one hundred and fifty to two hundred thousand dollars. Insurance will be divided between practically all the companies doing business in Nova Scotia. As work in the diflerent shops is dependent upon the output of the other departments, it is probable that fully eight hundred men will be temporarily thrown out of employment.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

PALMERSTON, ONT.—The McIntyre Automobile Co., the Canadian branch of the well-known McIntyre Co., of Indiana, propose establishing a plant here. They will probably install $25,000 worth of machinery.

WELLAND, ONT.—An order for one thousand steel cars has been received by the Canada Car & Foundry Co. The cars are to be built by the C.P.R. The Canada Car & Foundry Co. have plants at Welland and Montreal. Part of the cars will be made at Welland and the remainder at the latter city.

CLINTON, ONT.—It has been reported that a large American auto firm will take over the Thresher Co.'s plant here and establish a branch automobile industry.

GALT, ONT.—The Canada Potato Machinery Co. have taken over the business of A. M. Rush, of Preston, manufacturers of stable supplies, and will move it to this city.

SYDNEY, C.B.—At the annual meeting of the Marine & General Engineering Co., held recently, it was announced that a Norwegian chain making concern is anxious to locate here. If the negotiations go through successfully Sydney will have the only chain-making industry in Canada.

ST. CATHARINES, ONT.—The City of St. Catharines has granted to Steel & Radiation, Ltd., 30 acres of land. An extensive plant, comprising six large buildings, will be erected thereon. The buildings will be all brick, surfaced with concrete. The first to be erected, work on which has been commenced, will be the foundry, which will cover a ground space 120 by 200 feet. Other structures will include machine and pattern shops, and the plant, when ready for occupancy, will cost approximately $125,000. Mr. Herbert has let the whole work to F. C. Hitch & Co., Montreal, and construction is being done under day work supervision.

SARNIA, ONT.—The Peterson Foundry property has been leased to the Acheson Graphic Co. for a year.

GALT, ONT.—The Galt Brass Co. are adding a storeroom to their plant and installing additional machinery.

MARYFIELD, SASK.—Humphries & Bennett have taken over the business of S. A. Anderson & Co., boiler makers, machinists, etc.

WESTPORT, ONT.—A disastrous fire wiped out the Electrical Plate Works, better known as the Westport Foundry Co., here, recently. The loss will not be covered by insurance, only a few tools being saved.

FORT FRANCES, ONT.—It is current report that the C. N. R. have prepared plans whereby they will establish their car shops at Fort Frances.

ST. CATHARINES, ONT.—The Yale-Towne Co., of Stamford, Conn., will establish a big lock manufacturing plant here, and give employment to 200 people.

VANCOUVER, B.C.—The new shipbuilding plant for J. R. VanDyke & Son, formerly of Everett, Wash., is completed and in operation.

HAILELBURY AND OTTAWA, ONT.—T. A. Magee, machines, has assigned to W. A. Cole.

GALT, ONT.—Reports from the Canadian Motors, Ltd., opened a few months ago, are very encouraging, especially since the Montreal motor show, where they secured a large number of orders. Their representative is now out west in quest of business.

NEW WESTMINSTER, B.C.—The Schaake Machine Works have been working overtime of late in an endeavor to clean up the order list. A large quantity of mill machinery has been manufactured lately.

VANCOUVER, B.C.—The Call Automatic Switch Co., of Denver, Colorado, which has a capital of ten million dollars, have decided to organize a Canadian company to manufacture railroad switches, and more particularly the Call automatic switch. They expect to build a factory in Vancouver, having a capacity of 50 switches per day, and employ about 200 hands. The demand for railroad switches in Canada at the present time far exceeds the home supply, and there seems to be a great opening for a business of this kind, especially in western Canada. In three years' time the stock of this concern has risen from 10 cents to $10 per share.

HALIFAX, N.S.—The Canada Iron Corporation are extending their steel plant at Londonderry, and hope to be running full blast by midsummer.

TORONTO, ONT.—The crane foundry of J. Hepburn was damaged by fire to the extent of $6,000 some time ago. A large number of valuable patterns were destroyed.

CARLETON PLACE, ONT.—The car wheel works here have been taken over by an American syndicate. They are said to have a contract of 200 wheels per day for five years.

PETERBORO, ONT.—Fire caused $300 damage to the Lundy Tool & Shovel Co. here recently.

CALGARY, ALTA.—It is said that Sir Thos. Shaughnessy will come here next autumn and look over the situation before any definite steps are taken to establish the C. P. R. shops here.

Trenton

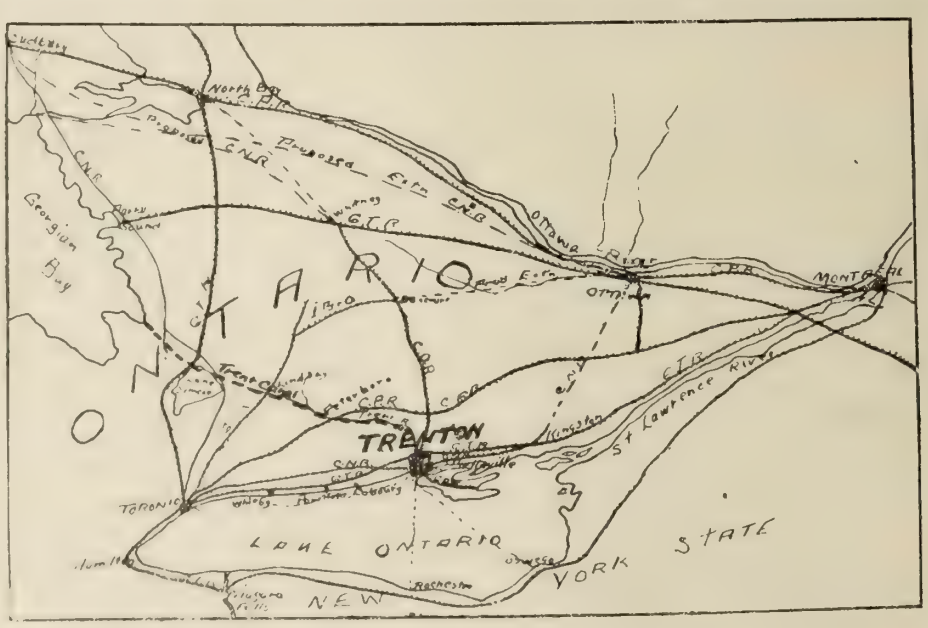
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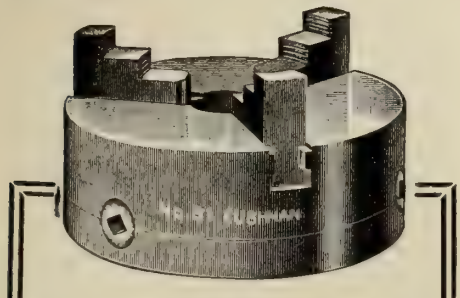
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We have the equipment and the experience. Ask us for prices.

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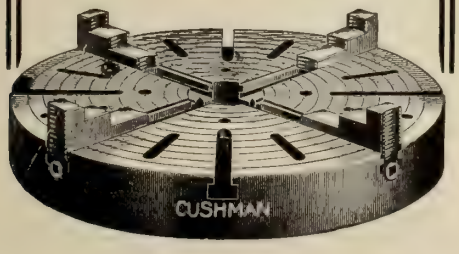


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Hartford, Conn., U.S.A.
Established 1862



GALT, ONT.—The R. McDougall Co. are adding a new molding shop to their plant here. It will be of brick and steel.

WINDSOR, ONT.—The Walkerville plant of the Dominion Motors Co., which recently went into voluntary liquidation, is again in operation, under new management. The assets of the company have been acquired by Enoch Smith, Detroit, who represents a group of Detroit and Windsor capitalists.

TORONTO, ONT.—The Polson Iron Works are building a huge floating dock here, to consist of two sections or pontoons, with high sides and open ends, each section being 150 feet at the side and 165 feet over the outriggers. Each will have a lifting capacity of 2,250 tons, and have two electrically-driven centrifugal pumps, with a capacity of 5,000 gallons per minute.

WEST TORONTO, ONT.—The C. P. R. are adding a bridge-building shop to their premises here.

PORT MANN, B.C.—The American Car & Foundry Co., of Pittsburg, Pa., will establish a huge plant here. It will be operated under the title of the British Columbia Steel Corporation. They will manufacture freight cars at the start, but will eventually build the latest models of Pullman and other passenger coaches. The capacity will be one thousand tons daily. There will be two 300-ton blast furnaces and five open-hearth furnaces, together with all other incidental equipment required to turn out the highest grade of steel.

MONTREAL, QUE.—The Dominion Steel Co. has a contract from the G. T. R. for 40,000 tons of steel rails. Fifteen thousand tons of this order will be delivered in November and December. The cost will amount to considerably over one million dollars.

HINTONBURG, ONT.—The C. P. R. are erecting a semi-circular sixteen-stall roundhouse here.

FORT WILLIAM, ONT.—The Imperial Oil Co. are making extensive improvements to their plant here, including an addition to the storage capacity of 1,500,000 gallons; a new coal handling plant on the island to cost $3,000,000 and a new cleaning elevator.

LETHBRIDGE, ALTA. — The Canadian General Supply Co., a wholesale distributing company, have located here. They will handle a complete line of mine, mill, building and contracting supplies, and also deal in the following main specialties: Gasoline locomotives, for mine hauling purposes, manufactured by the Ironsides Dyckerhoff Co., of London, England; a complete line of the goods put on the market by the Canadian Buffalo Forge Co.; structural steel work of all kinds; mosaic tile flooring, and many other lines.

LONDON, ENGLAND. — The number of Canadian companies which are extending their businesses in the United Kingdom continues to increase. Owing to Lloyd George's "Trade Mark Act" Canadian possessors of patents must manufacture in the United Kingdom to take advantage of the protection afforded them. This is the reason which decided the Dominion Register Co., of Toronto, to build a plant here.

SWAN RIVER, MAN.—It has been announced that the C. N. R. will build a new steel bridge over the river here, the estimated cost being over $20,000.

FORT WILLIAM, ONT.—The Joint Street Railway Co. favor the establishment of a car works at the head of the lakes, and a report will be made on the proposal. There is some doubt whether the two cities should engage in the manufacture of cars.

QUEBEC, QUE.—The Traction Cultivator Co., of Gainesville, Ga., propose establishing a plant here; as also does a Detroit automobile firm, represented by W. H. C. Burnett, of Detroit.

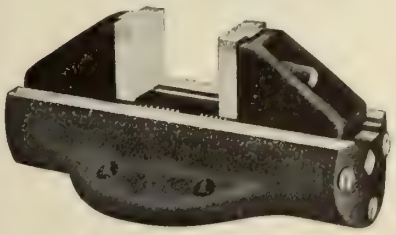
QUEBEC, QUE.—The St. Lawrence Car Co. are seeking to obtain the balance of the capital necessary to establish their plant here.

ST. JOHN, N.B.—It is rumored that a syndicate, headed by Sir Henry Pellatt, is negotiating to secure control of the five independent nail works in Canada to compete with the two combines already existing. The independent plants are located at St. John, Montreal, Toronto, in western Ontario, and British Columbia, making the strategical position of the proposed combine very strong. It is understood that the Maritime Nail Works is considering an offer to purchase their business at a high figure.

MONTREAL, QUE.—R. Bennett and M. Waller, doing business as "The International Supply Co.," assigned on demand of the W. Bennett estate. Their liabilities are about $3,100, divided amongst 55 creditors. The assets consist of stock, fixtures and tools at the factory, Lagauchetiere St., with unfinished contracts for prism lights, etc.

Two-Jaw Box Chucks

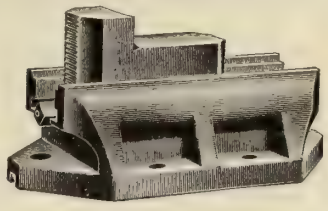
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Body and sliding jaws made from steel castings. Strong, durable--yet light in weight.

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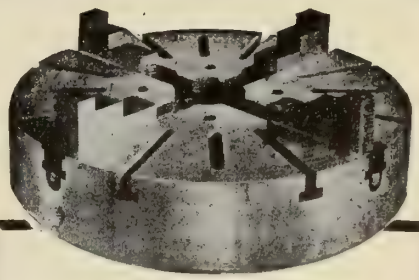
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MEDICINE HAT, ALTA.—The Gordon Nail Co., late of St. John, N.B., are arranging to establish an $80,000 plant here.

SASKATOON, SASK. The International Harvester Co. and the Imperial Oil Co. are both making material additions to their plants here. The latter company will spend in buildings this year $500,000.

RESTOULE, ONT.—C. Roberts has opened a machine repair shop here.

MEDICINE HAT, ALTA.—The Alberta Foundry & Machine Shop Co. propose erecting a plant in this city to cost $10,000. This company has been operating at Three Rivers, Que.

GODERICH, ONT.—The Rice-Knight Co., of Toronto, propose erecting a factory here to prepare the brass fixtures used in their lighting systems.

HALIFAX, N.S.—The Nova Scotia Car Works are making several additions to their plant here. New machinery has been installed in order to increase the output, and a steel underframe department is being added. The wheel foundry is also being enlarged.

VANCOUVER, B.C.—The Western Steel Corporation has purchased 2,000 acres of land with 17,000 feet water-frontage on the Fraser river, and will erect a large steel plant in the course of the next three years, at an expenditure of about $5,000,000. A start will be made on the plant this year, and it is expected to expend $1,500,000 on the first section. It will manufacture articles varying from horseshoe nails to structural steel.

MONTREAL, QUE.—It has been announced here that Vickers' Sons & Maxim have the contract for the floating dry dock to be built here. The plans provide for the construction of a floating drydock with a lifting capacity of 27,000 tons; the establishment of a ship-repairing plant and a mill for the production of steel railway ties, in respect of which they receive from the Canadian Government a subsidy of three per cent. interest on $3,000,000 for a period of thirty-five years. The dock is to be completed and installed by May, 1912, by which time the basin will be ready for its reception.

WINNIPEG, MAN.—It is reported that contracts for additional $2,000,000 construction on the G. T. P. shops at Transcona are to be let shortly.

NELSON, B.C.—The new zinc smelter of A. G. French is practically completed. It will have a capacity of five tons per day. Mr. French will also install a plant at a gold mine near here.

VANCOUVER, B.C.—A plant, which, it is said, will cost $200,000, is shortly to be erected at Port Mann by a syndicate of Englishmen and Scotchmen for the purpose of manufacturing nuts, bolts, fishplates and other railroad material. It is said that at the start it will give employment to at least 100 men.

SAULT STE. MARIE, ONT.—$2,000,000 will be spent improving the "Soo" pulp mill recently purchased by the Lake Superior Paper Company.

PORT ARTHUR, ONT.—C. Curran is establishing a new industry here, to be known as the Lake City Boiler Compound Works, to manufacture a new compound for cleaning the interior of boilers and tubes.

PORT ARTHUR, ONT.—The Western Dry Dock Co. are entering into the manufacture of steam boilers and tanks of all kinds, and are preparing to erect a huge plant here. Orders have also been placed for the equipment, including the latest hydraulic machinery. A boiler works will be one of a notable group of buildings that will be clustered around the dry dock, including foundry, machine shops, punch shed, boiler works and woodworking shop. The foundry and machine shops will be equipped to construct engines and all classes of machinery required on a ship, as well as all the other cast iron work used in shipbuilding. The other shops will be equipped to shape and punch the plates, while the forging shop will take care of all the wrought iron required.

SYDNEY, C.B.—There is a possibility that the Nova Scotia Steel & Coal Co., once they have their collieries at South Bar working in good shape, may remove their iron and steel plant to this side of the harbor. This move would greatly facilitate the handling of its iron ore.

SYDNEY, C.B.—A charter has been granted a company with a capital of $10,000,000 for a shipbuilding plant at Sydney Harbor. Sir Henry Pellatt, Toronto; Gov. J. M. Gibson, C. Ellis, Clyde Bank, Scotland; A. Gracie, Fairfield Ship Co.; A. Cross, Sydney, are the incorporators. The company will carry on business under the name of the British-Canadian Shipbuilding & Dock Co. This move presages a boom in the Maritime Provinces.

MEDICINE HAT, ALTA.—By-laws will be voted upon early this month granting con-

cessions to a foundry and machine shop, and a nail factory.

WINNIPEG, MAN.—The Wortman & Ward Co., manufacturers of pumps and farm tools, have decided to extend their plant here as soon as electric power is distributed by the city. The Vulcan Iron Works are also enlarging their plant.

LONDON, ONT.—The McClary Mfg. Co. are adding a $6,000 warehouse to their plant here.

FORT WILLIAM, ONT.—A large automobile concern are contemplating the erection of a plant here.

SASKATOON, SASK. — The Saskatoon Foundry Co. are branching out in a new direction, namely, the manufacturing of up-to-date well drills, the first of which has been tested at their foundry. These are the first of their kind to be manufactured in this province. The machine drills a six-inch hole several hundred feet deep, and the driving power is supplied by a Fairbanks-Morse gasoline engine, mounted on the front of the outfit.

PORT ARTHUR, ONT.—The Atikokan Iron Co. are contemplating the erection of a foundry in connection with their blast furnace, for the manufacture of pipe.

WINNIPEG, MAN.—Sites have been purchased by the Anthers Foundry Co., of Toronto, the Wortman & Ward Co., and the Canadian Carbon Co., for the erection of three more large factories in Winnipeg. The Anthers Foundry Co. has purchased a four-acre site, where a large plant will be erected.

CARLETON PLACE, ONT.—H. W. Dummert and W. H. Thoms, Jr., of the C. P. R. shops, have received a patent on an invention of their own, a new hub liner for locomotive trucks. The C. P. R. have secured the right to manufacture the device for their own use.

SASKATOON, SASK.—The C. P. R. announce that they are increasing their terminal facilities at Sutherland, and that during the current year they will spend $50,000 for this purpose. This amount will be expended on the extension of their present shops and the round-house. An innovation is the erection of a traveling crane in the freight yards for the convenience of handling heavy commodities, such as steel and stone, which are at present handled by crowbars and other primitive methods.

LACHINE, QUE.—The Dominion Bridge Co. will make a large extension to their already immense works during the coming summer.

MONTREAL—R. J. Levy, manufacturer of oxygen welding process, has removed to new and enlarged premises in Viauville, Montreal. The firm erected a commodious factory, with all conveniences for the manufacture of oxygen and for welding.

Municipal.

SOUTH VANCOUVER, B. C.—The ratepayers have authorized an expenditure of a million and a half dollars for municipal undertakings. Of this sum $300,000 is for the waterworks, and $260,000 for erecting new schools, etc. Over a million dollars will be spent on road and street improvements.

WINNIPEG, MAN.—It has been announced here that the Government Elevator Commission will acquiesce to the demand of the grain growers and put in a full complement of modern machinery at all of the Government elevators.

TORONTO, ONT.—The city has set apart $5,000 to secure detailed plans and specifications for a tube system on Yonge Street from the Union Station to St. Clair Avenue.

CALGARY, ALTA.—The estimated revenue of the waterworks department for this year is expected to be in the neighborhood of $163,000; and the expenditure, it is hoped, will be kept well within this figure.

RIDGETOWN, ONT.—This town has practically decided to invest a sum not exceeding $35,000 in a waterworks system. The public feeling is overwhelmingly in favor of the project.

CAMROSE, ALTA.—The Dominion Sewer Co., Swansea, Ont., have secured a $5,000 order from this municipality. Gartshore & Thompson Pipe Foundry, Toronto, secured a contract for cast iron pipes, their tender being $43.20 per ton, and $66 per ton for specials. The tender for valves and hydrants, amounting to $2,028.52, sent in by McAvity & Sons, St. John, N.B., was accepted.

NEW WESTMINSTER, B.C.—A gas manufacturer has a proposition to install a plant here to supply gas at less than current rates. He proposes using mill refuse and selling gas at $1 per 1,000 feet.

MOOSE JAW, SASK.—The ratepayers have passed a by-law authorizing an expenditure of $175,000 for sewer and water extensions, and $50,000 for an incinerator.

PRINCE RUPERT, B. C.—City Engineer Davis has submitted plans calling for an expenditure of $480,110 on a water system.

EDMONTON, ALTA.—J. Cornwall, M.P.P., of Peace River, will pave a street in Edmonton free of cost to demonstrate the paving qualities of asphalt found in the north country. He hopes to show by the test that there is a good field for the asphalt paving industry in the north and to emphasize the necessity of building a railroad up there.

BRANDON, MAN.—A proposition is on foot here to establish a street car system having twelve miles of track and twelve cars.

VANCOUVER, B. C.—The receipts of the waterworks office for the first quarter of the year amounted to $121,821.60. This total is to be compared with $86,769.51, the receipts for the corresponding period last year, neting an advance of over 40 per cent. The receipts for the first quarter of preceding years are as follows: 1909, $75,592.80; 1908, $65,330.16.

EDMONTON, ALTA.—The city council has finally decided upon the terms of the agreement with the International Heating & Lighting Co., of Cleveland, for the local gas franchise. The by-law will be submitted to the ratepayers. The franchise is for twenty-five years, the city retaining the right to purchase. The initial price fixed for gas is $1.65.

NEW WESTMINSTER, B.C.—By-laws totaling over $500,000 were endorsed by New Westminster ratepayers. The by-laws that passed are: Street improvements, $300,000; water extensions $35,000; light extensions $25,000; harbor improvements, $15,000; and garbage system, $5,000; Lulu Island bridge, $30,000; fire hall, $12,000, and the public school by-law, $95,000. The by-law to raise $75,000 for a high school was defeated. The park improvement by-law, $35,000; city stables, $20,000, and the storehouse by-law, $15,000, also failed to carry. It is the intention of the council, however, to erect a storehouse and stable and charge the amount to current revenue.

VICTORIA, B.C.—The cost of the new sewage system for Esquimault will be in the neighborhood of $125,000, which sum will be borrowed from the Provincial Government under the provisions of the District Sewerage Act, 1910, and amendments passed at the recent session of the Legislature.

MONTREAL—It is expected to have all the tenders for the new $2,000,000 water system in shortly and the contracts awarded by the month of June. The specifications are elaborately worked out. They were prepared by Hering & Fuller, the New York consulting engineers, who have made a specialty of filtration systems all over the United States. The double filter system has been recommended.

VICTORIA, B.C.—The city engineer has recommended an expenditure of $290,000 for sewer construction, and an additional $50,000 for drains.

Electrical.

UXBRIDGE, ONT.—F. B. Clark & Co. have taken over the electric light mill here, and the town will now have an all-night service.

BOWMANVILLE, ONT.—The citizens have carried the by-law authorizing the sale of the electric light plant and franchise to the Seymour Power Co. The Seymour exemption by-law was defeated.

OWEN SOUND, ONT.—The C. P. R. liners, Alberta and Athabasca, will have new electric lighting outfits to take the place of the obsolete plants now on these steamships. Two turbine engines will supply the power on each vessel, and will be so arranged as to admit of their being operated coupled or singly. New wiring and switch boards are being put in by the company's electricians and new turbines and dynamos. With the new equipment, these vessels will be brought up to the standard of efficiency the company maintains.

OTTAWA, ONT.—The Government has installed a new electrical apparatus in the Canadian mint, to separate the gold from the dross. The introduction of the electrical process of gold refinement places Canada's mint in a par of up-to-dateness with any mint in the world.

STETTLER, ALTA.—The ratepayers will be called upon to vote $15,000 for the installation of a municipal lighting plant.

NEW GLASGOW, N.S.—The Board of Trade is considering the installation of an electric light plant, with a capacity of 150 h.p.

MONTREAL, QUE.—D. L. McGibbon has purchased the Cedar Rapids. Cedar Rapids are 27 miles from Montreal, and, it is estimated, will generate about 150,000 horse-power, making it one of the largest power propositions in this part of the country.

WINNIPEG, MAN.—The city has decided to strengthen the big retaining walls of the canal of the city power plant at Point du Bois.

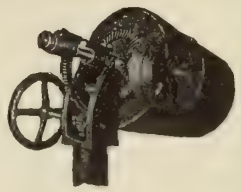
GALT, ONT.—The National Electric Co. have moved their plant to Toronto, and will turn out their line of manufactured goods in larger quantities.

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LONDON, ONT.—The water commissioners have expended practically all of the $235,000 voted by the people for Niagara power construction purposes in this city. Another $50,000 will probably be required.

WATERLOO, ONT.—To the Town of Waterloo belongs the distinction of being the first municipality in the Niagara power union to pump its city water by Hydro-Electric power. The new electrically-driven pump has been successfully tested.

HAMILTON, ONT.—The Canadian Westinghouse Co. has secured a large contract from the City of Sherbrooke, Que., for an addition to the municipal power plant. The local concern will construct all the generators, switchboards, exciters, etc., and the whole work will cost about $40,000. Sherbrooke already has a good-sized water power plant and the machinery ordered is for an additional power house, which will develop 3,000 horse-power more. The machinery is to be installed in about eight months.

STRATFORD, ONT.—The City of Stratford has been given special permission to amalgamate its light and water commissions to operate the two plants. The by-law to borrow $85,000 for the new Hydro-Electric plant and to take over the electric plant of the Stratford Gas Co. as an extension, has been ratified.

MONTREAL, QUE.—The city has acquired ten acres at Point St. Charles for the purpose of widening the old conduit running to Lachine. This move affords the available water power for the generation of electricity in a new civic power plant to be erected.

WEYBURN, SASK.—The new municipal power plant was put in operation recently. This plant not only develops electricity for power and lighting, but also operates the waterworks pumps.

LETHBRIDGE, ALTA.—The city's electric light and power plant was operated during the year 1910 at a net profit of $30,864.52. The total receipts of the plant for the year were $86,221.30, and the expenditures, including debentures, interest and sinking fund apportionments, $35,356. One of the reasons for the splendid showing made is the operation in conjunction with it of a municipally-owned coal mine. The coal is charged to the electric plant at the rate of $150 per ton, and even at this low rate the mine netted the ratepayers a nice little profit for the year 1910.

BLYTH, ONT.—The Village of Blyth has purchased the electric light plant from the Molsons Bank, and will run it in the interests of the corporation. The price paid was $2,500. J. Nivens continues as engineer.

STRATFORD, ONT.—Stratford is now an all-Niagara power city. The old steam plant that has been used to supply a direct current district up-town is shut down and will be used only in cases of emergency. Hydro-Electric power now runs everything—and satisfactorily.

MONTREAL, QUE.—The council recently revived the question of the city purchasing the plant of the Montreal Water & Power Co. This purchase was a live issue in the council last fall, when the controllers reported very strongly against paying $7,000,000 for the plant. This step was taken on the strength of Mr. Janin's report, in which he estimated the value of the plant as $2,000,000.

FREDERICTON, N.B.—A proposition is on foot here to amalgamate the pumping station and city electric lighting station by the removal of the electric lighting plant, at a cost of $17,000. This would also necessitate the erection of a new building and the enlargement of the boiler-room.

PORTAGE LA PRAIRIE, MAN.—The city council has been negotiating with the Winnipeg council, with a view to getting power from the Winnipeg municipal plant at Point du Bois.

MOOSE JAW, SASK.—The new power house and car sheds for the Moose Jaw Electric Railway Co. will be one of the largest power house buildings in the west, covering a space of 250 by 63 feet. The contract has been given to Navin Bros., of Moose Jaw.

GALT, ONT.—The city has spent $66,000 on Niagara power and will require an additional $25,000 to complete the system.

VICTORIA, B.C.—The city council has decided to make the following purchases of apparatus and plant to carry out extensive additions to the street lighting system: Thirty-five thousand feet of 3-inch fibre conduit, at $7,50 per 100 feet; 50,000 feet of 1-inch galvanized steel conduit, at $8.40 per 100 feet. Tenders are being called for a supply of 150 cedar poles; 8,000 pounds of copper line wire; 1,000 pounds of flexible arc cable; 1,000 glass insulators; 150 magnetic arc lamps and cut-outs; 450 light transformers, and 1-20 circuit arc switch-board.

BRANDON, MAN.—An order has been placed by the Brandon Electric Light Co. for an

engine, which will add 2,250 horse-power to the present capacity and bring the total up to 5,000. This will make the plant the largest for any city of the same size in Canada. The engine is a cross-compound Corliss and its weight 155 tons. It will require 18 cars to transfer it from Galt here.

STE. PAUL, QUE.—The Canadian Light & Power station will be fitted out in the course of a few weeks. A set of Babcock and Willcocks patent boilers have been put in place, and the steam turbine generator set.

FORT WILLIAM, ONT.—A. L. Farquharson, manager of utilities in Fort William, has informed the Port Arthur council that in order to supply power for the street railway it would be necessary for Port Arthur to purchase a new motor generator, at a cost of $24,000.

HAMILTON, ONT.—The council appointed E. J. Sifton, London, as expert to draw up plans and specifications for a municipal light and power plant.

WEYBURN, SASK.—Weyburn's new electric light plant has been put in commission and is thoroughly up-to-date. The engine and dynamo at the old plant were taken down and removed to the new power house, where they will serve as an auxiliary.

HARROW, ONT.—J. A. Secord has disposed of the Harrow electric lighting plant to Detroit capitalists, who already own the plants in Leamington, Kingsville and Essex. A large power house is to be erected in Sandwich, with which the lighting systems of all these towns will be connected. They will furnish both light and power, giving both night and day service. The new firm have assumed control.

General Manufacturers.

LONDON, ONT.—Hourd & Co., furniture manufacturers, are making extensive additions to their factory here. They have recently given large orders for new machinery, and are making other improvements to their present plant. They are about to install an electric power plant, in addition to their steam power plant, which will be retained.

GALT, ONT.—The Crown Furniture Co. have pulled down their old power house and are erecting a large four-storey brick building, to cost approximately $12,000.

SACKVILLE, N.B.—The Sackville Concrete Limited is the proposed name of a new company, which will undertake the manufacture of concrete blocks for building purposes, and other concrete work. The provisional directors are: Dr. Secord, C. C. Avard, S. W. Copp, H. M. Wood and Dr. Hart.

SYDNEY, N.S.—Alex. Cross & Sons, of Glasgow, have closed a contract with the Dominion Iron & Steel Co. for a supply of Bessemer slag, and are building a plant here to manufacture fertilizer therefrom. The home office has appropriated $250,000 for the Sydney end of the business. The plant will cost about $100,000, and already tenders have been called for.

EDMONTON, ALTA.—A $60,000 plant for handling petroleum products, together with all necessary offices and stables, will be erected by the Imperial Oil Co. this spring.

TORONTO, ONT.—The Sunbeam Incandescent Light Co. propose extending their plant on Dufferin Street.

SARNIA, ONT.—It has been reported that the American Brewing Co. intend locating a branch in Canada, and negotiations are under way to bring the plant here.

SARNIA, ONT.—The Sarnia Fence Co. have prepared plans for an extension to their factory.

OTTAWA, ONT.—The McFarlane, Douglas Co. are building a new factory for the manufacture of fireproof doors and windows.

ST. JOHN, N.B.—Experts from the Linde British Refrigeration Co., of Montreal, have inspected the cold storage plant recently taken over by the C.P.R. from the N. B. Cold Storage Co., and have recommended extensive alterations and repairs, involving considerable expense.

GODERICH, ONT.—Fire caused $50,000 loss to the plant of the Kensington Furniture Co recently.

St. JOHN, N.B.—The Albert Manufacturing Co. will erect a $100,000 plaster mill in Hillsboro, to replace the one recently destroyed by fire.

WINNIPEG, MAN.—Winnipeg will see nine new factories erected on Logan, Higgins and Henry Avenues, at a cost of $500,000. A site has been purchased by a well-known manufacturing firm, where a factory will be erected, at a cost of $50,000. A few blocks from this the warehouse and factory of the Ontario Wind Engine & Pump Co. has been completed, at a cost of $50,000. One block east the Burrage Copper Co. will have warehouses and offices erected before the beginning of June. This building will cost a similar sum to the other two mentioned above. Additions will be made this summer by the Imperial Oil Co. to their plant. The Canadian Baggage Co. also intends spending $15,000 on improvements. The wooden building used at present by the Copp Sons & Co. will be replaced by a brick structure. Five lots have been purchased by the Provincial Government on Bushnell Street, where a $25,000 warehouse is to be erected. It is understood that the Czerwinski Box Co. will add two more storeys to its present building, at a cost of not less than $75,000. The Gordon, Ironsides & Fares will spend $85,000 on enlarging its plant. It has been learned that the Coast Lumber Co. will maintain a yard in this district, which will have 8,000,000 feet of lumber on hand, and sheds for the teams.

PORT ARTHUR, ONT.—F. H. Keefer, K.C., who has returned from England, states that British capitalists will probably establish a huge meat packing industry at Port Arthur, in which they would invest $7,500,000. The new company would expect to get large contracts for supplying meats to the British army and navy.

SOUTH VANCOUVER, B.C.—A party of English capitalists are establishing a large enamel works here. They will turn out all kinds of enamelled ware from signs to kitchen utensils.

WINNIPEG, MAN.—Brown & Vallance, architects, have prepared plans for a four-storey warehouse here for the Canadian Fairbanks Co.

TORONTO, ONT.—A factory for the manufacture of laces in this country is being contemplated by a large Irish firm. W. W. Figgis, Dublin, is representing them.

SYDNEY, C.B.—The Dominion Tar & Chemical Co. has about completed an addition to its plant, which will enable it to do creosoting work. Creosoting greatly increases the life of timber in such forms as telegraph poles, railway ties, and piling.

BROCKVILLE, ONT.—The National Mfg. Co. purpose making extensive enlargements to their plants here. In an effort to concentrate their entire plant in this city, they will spend some $20,000 on new buildings.

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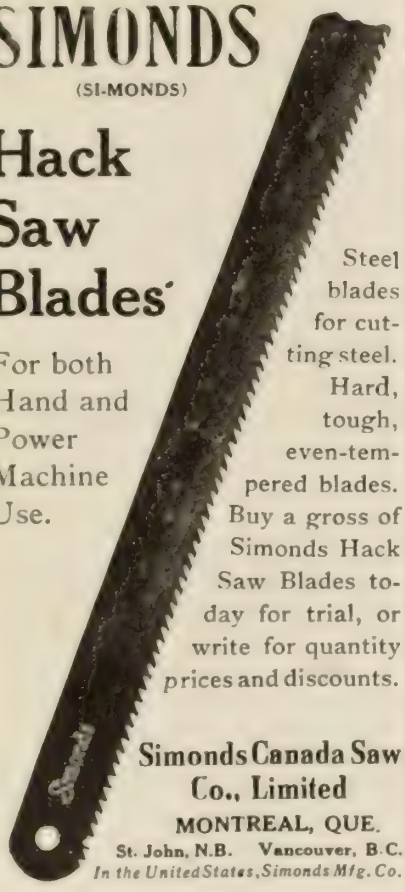
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BRIDGEBURG, ONT.—The Flanders Manufacturing Co., of Buffalo, have secured a factory here and will manufacture a great variety of showcases and patent devices, such as collapsible bookcases, mailing cases, etc.

SASKATOON, SASK.—B. F. Ward, of Minneapolis, proposes establishing a factory here to manufacture the by-products of flax straw, to be used in connection with the newly-invented Ware binder—the only arrangement that has been successful in solving the problem of the utilization and the tying of flax cord in the process of binding.

NEW LISKEARD, ONT.—Through the efforts of Mr. McLelland, Toronto capitalists will likely establish a large woodenware industry in this vicinity.

MONTREAL, QUE.—W. H. Bell, who purchased the factory buildings of the Bell Telephone Co., has had the premises refitted with modern machinery and now has the largest woodworking plant in Canada.

VANCOUVER, B.C.—The establishment of a number of plants from the Atlantic to the Pacific is contemplated by the Associated Portland Cement Co., of London, Eng. The plans involve an expenditure of millions of dollars in the Dominion.

PETROLEA, ONT.—The Shuttleworth Co., tile manufacturers, are contemplating an addition to their present plant.

MEDICINE HAT, ALTA.—A by-law was carried here granting a free site to the Alberta Linseed Oil & Paint Co., which will invest $80,000 in plant and buildings.

WINNIPEG, MAN.—The Canada Cement Co. intends establishing a plant here, with a capacity of 400,000 barrels per annum.

TORONTO—The Reinhardt Brewing Co. will build a new brewery on the corner of Mark Street and Don Esplanade. It will have three times the capacity of the present building and will cost in the neighborhood of $150,000.

RIDGEVILLE, ONT.—A large canning factory is being erected here for an incorporated company represented by A. W. Crow, of Fenwick.

TORONTO—The Aluminum & Crown Stopper Co. are erecting a large addition to their works here.

NEWCASTLE, N. B.—J. W. Miller and a St. John promoter are organizing a joint stock company to erect an extract works and tannery here. This will entail an expenditure of $125,000. Mr. Miller has attained a high position as an inventor and will introduce in the works a most successful invention of his own, which machine will tend to facilitate the manufacturing.

OWEN SOUND, ONT.—On May 6th the citizens will vote on three factory by-laws, viz., a knitting factory, a furniture factory, and a baby carriage and steel wheel factory. Two Toronto manufacturers are looking for a brass and iron bedstead factory site. They will probably ask a $20,000 or $25,000 loan, with the usual stipulations as to payment of principal and interest.

Building Notes.

TORONTO, ONT.—Knox College will erect buildings this year to cost $500,000.

TORONTO, ONT.—The plans for the sixteen-storey office building of the C.P.R. have been completed by Architects Darling & Pearson. The building will be of steel, and granite will be used for the walls of the lower storeys. It will be the tallest commercial building in the British Empire.

CALGARY, ALTA.—Harrod's Stores, London, Eng., will erect a building at Calgary, at an expenditure of $1,500,000. Burke, Howard & White, Toronto, are the architects.

WINNIPEG, MAN.—The new C. N. R. terminal will cost in the neighborhood of $5,000,000. The station, which has elevated tracks, covered subways to all platforms and quarters for immigrants, will be opened in July.

TORONTO, ONT.—The R. S. Williams Co. will erect a 10-storey building of reinforced concrete and steel, to cost $75,000.

QUEBEC, QUE.—The new plans for the Union Station, on the Champlain Market site, call for a $1,500,000 structure, which is somewhat larger than at first intended.

TORONTO, ONT.—The Boston Lunch are considering the erection of a six-storey building on Yonge Street, near Richmond.

TORONTO, ONT.—On the corner of Bloor and Avenue Road, W. S. Dinnick is contemplating the erection of a modern apartment house, to cost in the neighborhood of $600,000, exclusive of the site. It will be nine or ten storeys high, of brick and steel skeleton, and thoroughly fireproof.

VANCOUVER, B.C.—The Sailors' and Loggers' Institute are undertaking the erection of a $100,000 building here.

EDMONTON, ALTA.—The Edmonton Apartment Houses, capitalized at $500,000, will undertake the erection of several large apartment houses here. The first undertaking will be the erection of a big apartment block on Fifth Street, overlooking the river valley. This block will be five or six storeys high, and will cost nearly $500,000. It will be the most up-to-date apartment house in the west.

VANCOUVER, B.C.—The Exhibition Board will spend $200,000 on buildings this year.

MONTREAL—Ross & McFarlane have prepared plans for a ten-storey hotel, the site of which alone will cost $800,000. It is to be at the corner of St. Catherine and Peel Sts. The bond issue, it is stated, has already been placed, and while the American interests will be considerable, control will remain in Canadian hands.

VICTORIA, B.C.—Plans calling for an expenditure of $80,000 on the new St. John's church have been prepared by Architect R. Wilson.

EDMONTON, ALTA.—The Grand Trunk Pacific will erect a $750,000 hotel here in the near future.

WINNIPEG, MAN.—The Hudson's Bay Company are erecting a mammoth new store on Portage Avenue, to cost, with the site, $2,000,000.

TORONTO, ONT.—The Y. M. C. A. are about to erect a huge building on College Street, at a cost of $375,000, exclusive of the site.

TORONTO, ONT.—This year's building at Toronto University calls for nine new buildings and a heating plant, to cost $2,830,000.

EDMONTON, ALTA. — The Great West Saddlery Co. will erect a 6-storey warehouse here, at a cost of $100,000.

VANCOUVER, B.C.—The Wallace Fisheries, Ltd., have bought the cannery of C. A. Ternan, at Uchucklesat, on the west coast of Vancouver Island, and have prepared plans for a large cold storage plant of 1,500 tons capacity.

TORONTO, ONT.—G. Wright and E. M. Carroll, proprietors of the Walker House, have acquired the Caer Howell hotel property, on University Avenue, and will erect a fourteen-storey hotel, at a cost of $1,500,000.

VANCOUVER, B.C.—A. Davidson will erect a five-storey apartment house here, at a cost of nearly $100,000.

WINNIPEG, MAN.—P. Lyall & Sons purpose erecting a 16-storey building here, at a cost of $1,000,000.

PENTICTON, B. C. — McGaw & Winnett, managers of the Queen's Hotel, Toronto, are interested in a project to erect a large hotel here, at a cost of $100,000.

Harvesting Companies' Merger.

It has been announced that plans for the future expansion of Deere & Co., steel plow manufacturers, involve a merger with twenty-two industrial concerns; the consolidation of which is to have a single ninety-nine-year charter, with a capital of $50,000,000. The consolidation will be known as Deere & Co. Among those included are: Deere & Co., Moline; Deere & Mansure Co., Moline; Moline Wagon Co., Moline; Marseilles Co., East Moline; Kemp & Burpee Co., Syracuse, N.Y.; Dain Mfg. Co., Ottumwa, Iowa, and Welland, Ont.; Fort Smith Wagon Co., Fort Smith, Ark.; Deere & Webber Co., Minneapolis, Minn, and fourteen branch plants and houses, all having separate charters at present. The Canadian end of this merger will be located at Welland, Ont., where the Dain Co. are manufacturing, and it is understood that additional buildings will be erected in the near future on the land recently purchased adjoining the present plant.

Re-Organize Steel Firm.

Montreal.—The directors' board of the Dominion Steel Corporation will be reorganized in view of the recent death of Senator Forget. The Senator was first vice-president. The death of A. F. Dimmock, of New York, will leave another vacancy on the board, which was composed of J. H. Plummer, L. J. Forget, R. Wilson, Sir William Van Horne, Wm. McMaster, Sir Montagu Allan, Hon. G. A. Cox, G. Caverhill, H. F. Dimmock, Senator MacKay, Fred Nicholls, Elias Rogers, Senator McKeen and W. G. Ross.

Sir Wm. Van Horne is slated for the first vice-presidency, and Sir Henry Pellatt, of Toronto, it is rumored, will also have a place on the board.

The Quebec Bridge.

Ottawa, Ont.—The contract for the superstructure of the Quebec bridge has been signed, the amount involved being $9,000,000. A large guarantee has been posted for the carrying out of the contract.

As previously announced, the Dominion Bridge Co. and the Canadian Bridge Co. unite to form a construction company to do the

work, this company being known as the St. Lawrence Bridge Co.

The contractors of the new structure at Quebec agree to have the work completed by the 31st of December, 1911. The first thing to do is to purchase the land and erect new shops, the whole to cost $1,000,000, as no existing plant in the Dominion is sufficient to carry on such an extensive contract. The shops will be in, or near, Montreal, and not in the neighborhood of the bridge site, as has been suggested. The contract for the steel has already been given to the United States Steel Co., of Pittsburg, as the material will be too long for ocean steamers.

$500,000 Brass Merger.

Somerville Bros., brass manufacturers, with a capital of $100,000 and a large reserve, and the General Brass Manufacturing, capital $75,000, have been merged under the name of the United Brass & Lead Co., of Toronto, with a capital of $500,000. The promoters of the new company are: Alex. F. Fuller, of Chatham; Fred Somerville, Toronto; Murray James, Woodbridge; Lorne M. Somerville, and Andrew J. Somerville, of Toronto.

This new consolidation is outside anything in hte shape of a merger that is being attempted from Montreal. Efforts to absorb those two concerns were made a year ago, but met with failure. Brass manufacturers declare that there is nothing in the mooted merger so far as Toronto houses are concerned.

Saw and Planing Mills.

SOUTH ROXTON, QUE.—Wollet's saw mill, which sustained a serious loss by fire recently, is being rebuilt.

EBURNE, B.C.—The Eburne Saw Mills have been greatly enlarged. The old 100 h.p. engine has already been replaced by a 150 h p. engine of the latest design, while a new engine has been installed in the planing room. In addition, an extra saw is being set up to further increase the capacity.

RENATA, B.C.—P. Abrams has installed an up-to-date sawmill here, with a capacity of 15,000 feet per day.

BROCKVILLE, ONT.—The Briggs' mill was badly scorched by fire recently, due to defective wiring. The loss is fully insured

NEW WESTMINSTER, B. C.—Work has been started on the new mill of the British-Canadian Lumber Co., at Lulu Island. It is strictly electrical, and includes a box factory. Later on a sash-door factory will be added.

GALT, ONT.—P. W. Gardiner & Son have disposed of the retail lumber end of their business and will now devote their whole attention to manufacturing their specialty—doors, sashes and columns.

SARNIA, ONT.—The prospects of having a new sash and door factory located here are exceedingly bright, and a large amount of money has been subscribed towards the enterprise. A. H. Diver, of Trenton, has invested $25,000.

REVELSTOKE, B.C.—Following a recent heavy investment of British capital, approximating two million dollars, in timber and sawmill plants in Revelstoke district, brought about by A. McRae, T. Kilpatrick and G. S. McCarter, of this city, plans are formulating through a group of American and Canadian capitalists for the exploitation of the water power, pulp wood and timber resources of the district on a large scale. The initial investment of the syndicate involves the erection of a sawmill at Big Eddy, on the Columbia river. The mill will have a capacity of two hundred thousand feet per day and will be the largest plant of its kind in the interior of British Columbia. The power for these establishments will be derived from the rapids of the Columbia river, about three miles north of the city, where a power plant will be installed under the auspices of the same group of capitalists.

MOOSE JAW, SASK.—The Lumber Manufacturers' Yards, Ltd., opened up an up-to-date establishment here recently.

FONT HILL, ONT.—Mr. Beaumont, of Picton, is erecting a planing mill here and will open up a lumber yard.

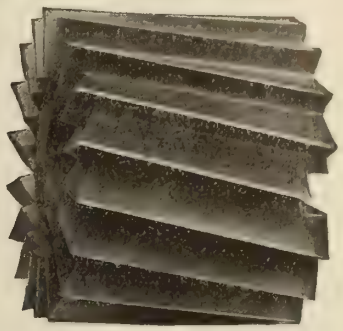
MARMORA, ONT.—J. Hayne and A. W. Dickerson, manufacturers of staves, hoops and heading, have dissolved partnership.

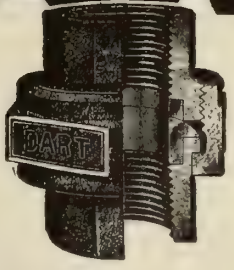
SUDBURY, ONT.—Casey & Shaw are making numerous improvements to their planing mill here. They will use steam power, instead of electricity, in the future.

STEAMBOAT, B.C.—C. A. Baldwin and his associates will erect a sawmill here to provide the lumber for the buildings to be required in the new camp this summer.

PENTICTON, B.C.—The Penticton Lumber Co. have about completed their big sawmill here. Operations will commence in a few weeks. A pipe and box factory will subsequently be built.

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EDMONTON, ALTA.—T. A. Burrows, lumber operator, will install three big mills this summer. One will be located near here, another near Jasper Park, and a third on the McLeod river.

NELSON, B.C.—The C. P. R., which is spending $8,000,000 this year on its Pacific division, will erect a large woodworking shop here for the mechanical department.

PRINCE RUPERT, B.C.—The British-Canadian Lumber Corporation, a $20,000,000 concern, will establish a sawmill and pulp mill here, and a large sawmill at New Westminster.

COBALT, ONT.—"The Cobalt Planing Mills," capital $40,000, have been incorporated to carry on the business of sawmill proprietors, etc. J. Joanisse and F. D. Connor, lumbermen; T. R. Jones and M. T. Culbert, mine managers, and H. Joanisse, carpenter, all of Cobalt.

ROSENDALE, MAN.—R. Stewart's sawmill suffered a $40,000 loss by fire. The engine alone was saved.

CAMROSE, ALTA.—Mr. Charette, of Beaumont, is setting up his sawmill here. This makes the third one in this place.

DRYDEN, ONT.—Recent developments indicate that the Dryden Timber & Power Co. will materially increase the capacity of the pulp mill and abandon the idea of doubling the capacity of the sawmill.

PENTICTON, B.C.—The new mill of the Penticton Lumber Co. is nearly completed. A large drying kiln will also be built, and possibly a pipe and box factory.

GUELPH, ONT.—A bad fire at the mill of Geo. McAllister recently did damage to the extent of $15,000.

CREEMORE, ONT.—Geo. Mustard, Jr., has bought the planing mill at Shelburne and already has possession.

NEW WESTMINSTER, B.C.—The plant of the Pitt River Lumber Co., at Coquitlam, including the sawmill and shingle mills, was damaged by fire recently to the extent of $250,000. Rebuilding will commence as soon as the insurance claims are adjusted.

SASKATOON, SASK.—Cushing Bros., of Edmonton, Calgary and Regina, have decided to built a mill here to manufacture doors, sashes, shop fittings, newels, etc. The boiler house will be of concrete, 34x40. The power will be produced by steam.

SCOTSTOWN, QUE.—The Guelph Patent Cask Co. have started their new veneer mill. It is a little over a year since this company bought out the Great Northern Lumber Mills. They have expended thousands on repairs and reconstruction, and now have the most up-to-date plant in Canada.

New Companies.

MONTREAL, QUE.—The J. Watterson & Co., capitalized at $150,000, have been incorporated, to manufacture and deal in iron, steel, metals, etc. J. Watterson, merchant, of Westmount; E. B. Busteed, King's counsel, C. L. Buchanan and J. Strachan, bookkeepers, and H. A. Daniels, stenographer, all of this city.

TORONTO, ONT.—The Moffat-Irving Electric Smelters, capital $40,000, have been incorporated to carry on a milling, smelting and reduction company, and to manufacture iron and steel, etc. J. W. Moffat, mining engineer, W. H. Garvey and J. A. Rowland, barristers, T. C. Irving and A. Dwyer, stenographers, all of Toronto.

BRANTFORD, ONT.—The Acme Electric Appliance Co., capital $300,000, have been incorporated to manufacture and deal in electrical appliances, apparatus, machinery, etc. G. Brereton, fruit dealer, and O. M. Mackie, promoter, of Hamilton; A. Sheard and L. J. Hastings, of Brantford, and N. G. Patterson, of Cambridge, Ont.

WALKERVILLE, ONT.—The New Dominion Motors, capital $100,000, have been incorporated to manufacture and deal in gasoline engines, etc. A. D. Bowlby, merchant, Windsor; W. Papst, farmer, W. C. Burt, farmer, D. Z. Curtiss, manufacturer, and E. T. Grosvenor, physician, all of Detroit.

KEMPTVILLE, ONT.—The Johnston Foundry Co., capital $40,000, have been incorporated to carry on a general foundry and machine shop business. W. S. Johnston, manufacturer, G. H. Ferguson, barrister, C. Johnston and E. Ferguson, and M. Eligh, stenographer, all of Kemptville.

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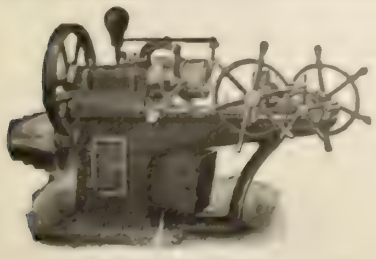
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And pluck my magic garment from me."
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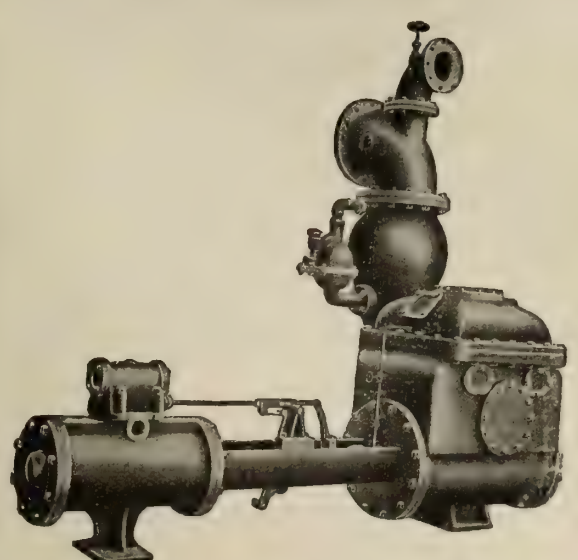
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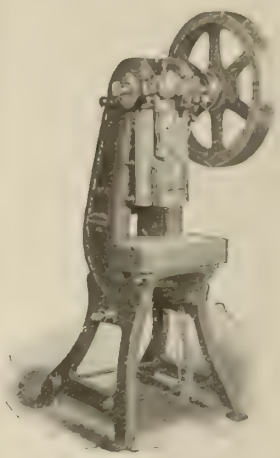
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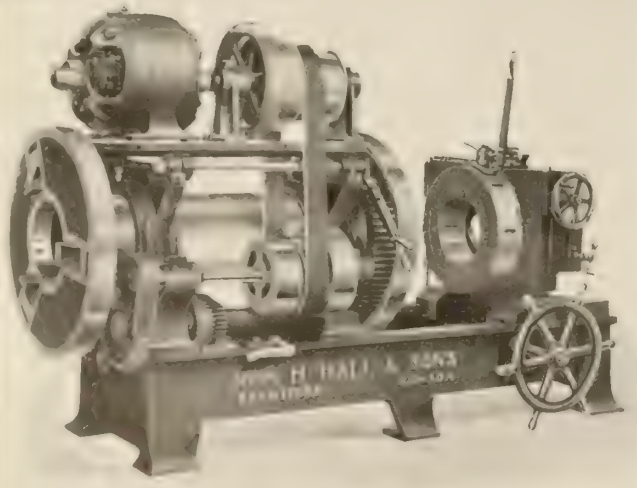
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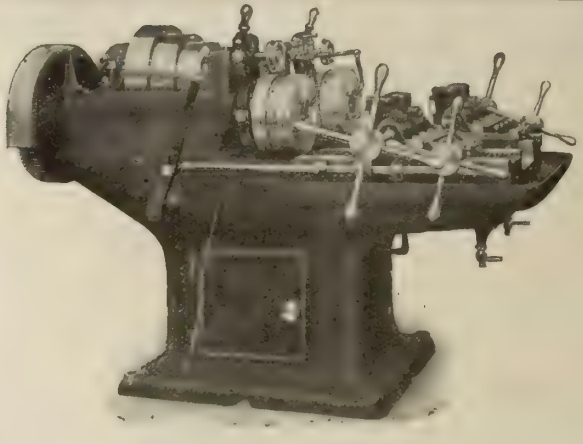
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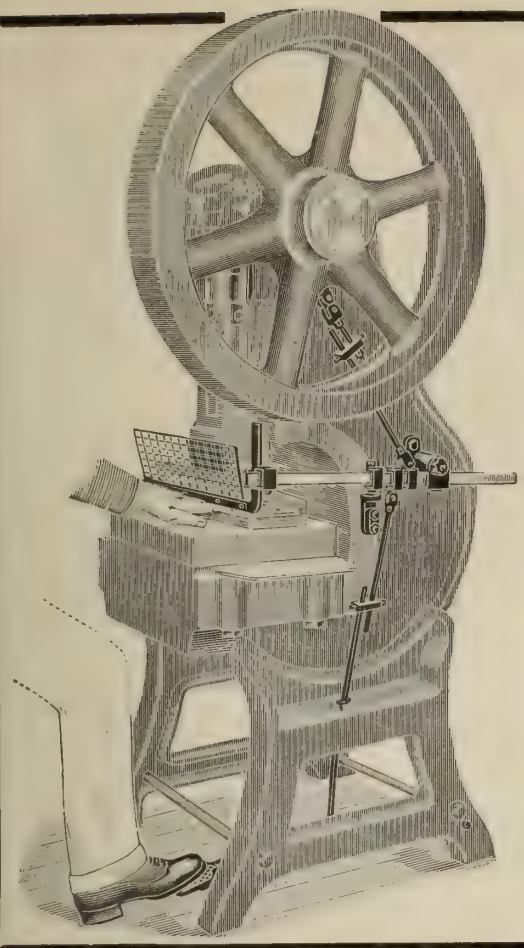
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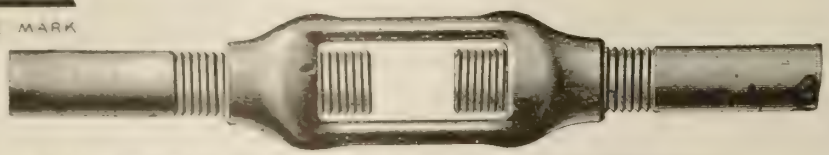
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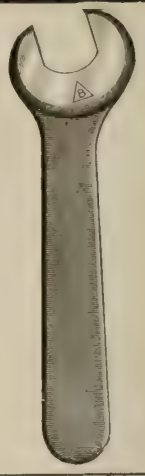
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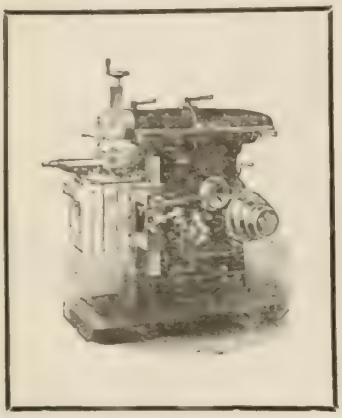


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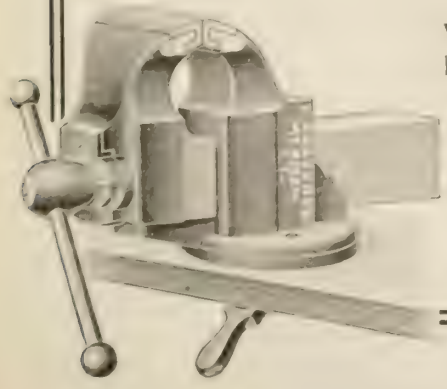
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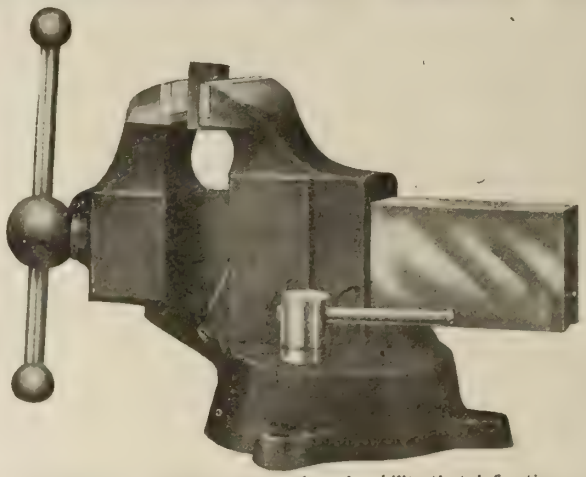


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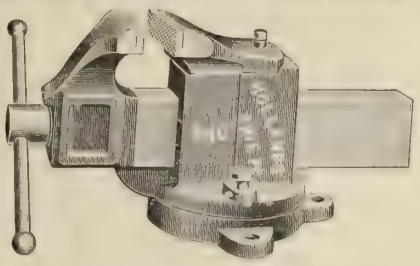
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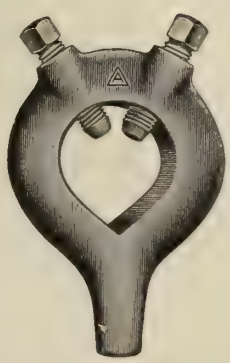
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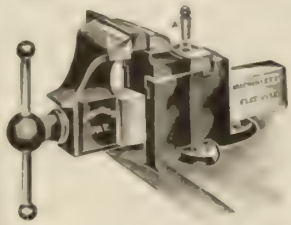


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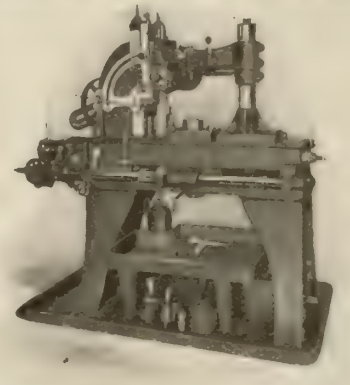
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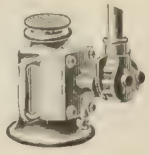
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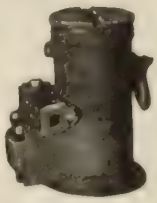
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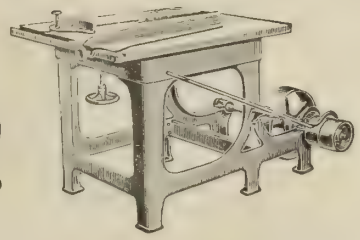
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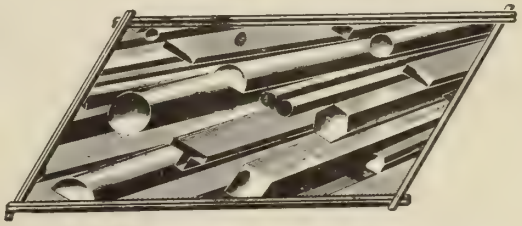
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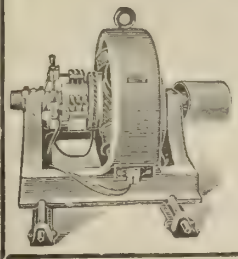
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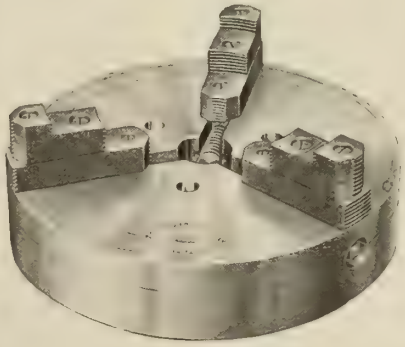
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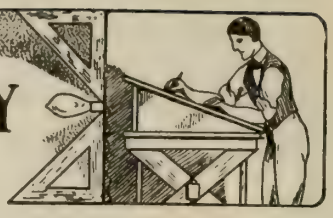
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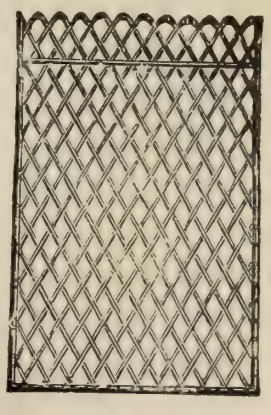
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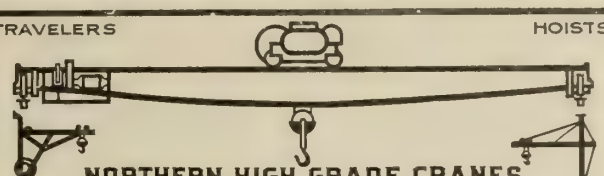
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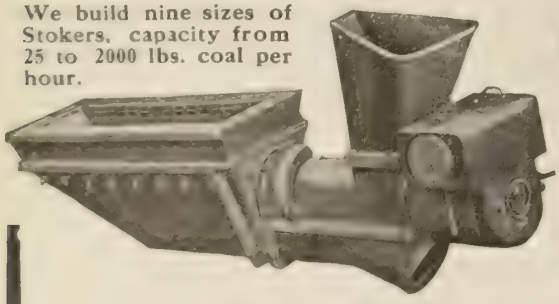
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Our Furnaces Heat Steel with the Cheapest Fuel on Earth—
SOFT, SLACK COAL

They are all fired with "American" Mechanical Stokers, which burn bituminous slack coal automatically and without smoke, and give a clear, steady, soft, non-scaling flame. You get increased production, at about one-third to one-half the operating cost of oil or hard coal. This is a fact. If you burn money to heat steel why not burn less of it, and write us at once?

The Standard Engineering Company Limited
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PITTSBURGH EMERY WHEEL CO.
MANUFACTURERS OF
EMERY WHEELS—All kinds and shapes.
SWING FRAME GRINDING MACHINES—Motor and Belt Driven.

CANADA FORD CO.
Montreal

603-604 Park Building,
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FOUNDRY ECONOMY

KING
Fuel Oil
Furnaces
For Melting
Bronze, Brass,
Aluminum,
Iron, Steel,
Etc., Etc.

Also Heating
Furnaces for
Rivet, Hammer,
Spring, Annealing,
Axe, Axle,
Bar, Bulldozer,
Forging,
Tempering,
Etc., Etc.

is attained by the use of high-grade

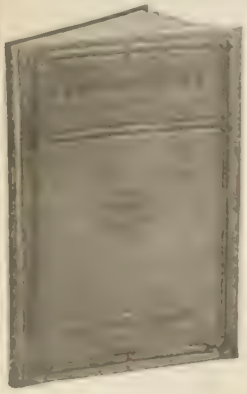
Plumbagos
Moulding Sands
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Coke and Coal
Core Compounds
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Partings, Etc.

P.S.—We manufacture Equipment of the highest efficiency.

F. HYDE & COMPANY
HEAD OFFICE:—
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if you are a subscriber to "Canadian Foundryman," by sending in to us four new paid-up subscriptions. If you are not a subscriber send in your own, along with the proper number of paid-up subscriptions and the book is yours.



Foundry Work

By Wm. C. Stimpson

[illegible] Foundry Work and Forging Department of Science and Technology, Drexel Institute.

100 pp., 150 illus. Cloth binding. A practical guide to modern methods of molding and casting in iron, brass, bronze, steel and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc.

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Given free with four yearly paid-up subscriptions.

The subscription price is fifty cents per year; two years for one dollar.

Canadian Foundryman
143-149 University Avenue, Toronto

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Detroit **WINDSOR** *St. Paul*

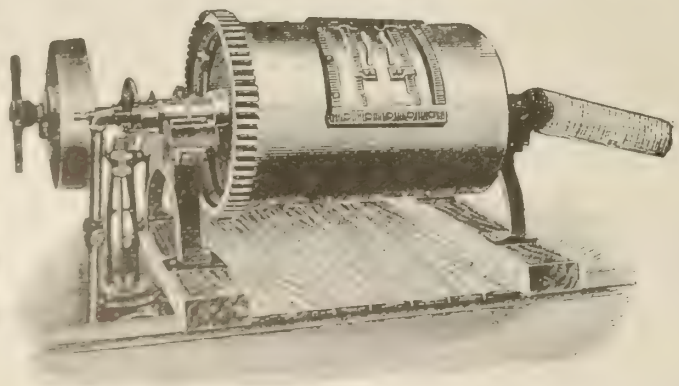
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FOUNDRY SUPPLIES
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BUFFING COMPOSITIONS
FIRE BRICK and
CUPOLA BLOCKS

By having warehouse in WINDSOR prompt shipments assured.

A GOLD MINE

SAVE YOUR IRON



SLY'S PATENT IRON CINDER MILL
Patented, No. 514097. Patented, No. 841728.

may be at your disposal on your very premises. Look out of your side window or back door and see if you have not an accumulation of cupola dump, and other foundry refuse, which is a total loss to you in its present state. Why not add to your profits and install one of the Sly Patent Cinder Mills to reclaim this iron and be astonished at your former loss and pocket the rich returns from your newly-discovered mine.

Sly's Patent Iron Cinder Mill will save 95% of the iron contained in your cupola dump and gangway scrapings and 75% of the coke. Iron is valuable, then why throw it in the dump? Iron recovered by this Mill is better than machinery scrap. Study economy in a foundry and your profits will increase accordingly. Mill will pay for itself three or four times every year, and we have records of Mill paying for itself twelve times a year. Let us know amount of your daily melt and we will quote. *Write for Cinder Mill Catalogue F.*

We also manufacture Cleaning Mills, Dust Arresters, Sand Blast and Foundry Equipment.

THE W. W. SLY MFG. CO., CLEVELAND, O.

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GLUTRIN
Reg. U.S. Pat. Off.

No core sand binder will cure all your foundry troubles.

But if you use glutrin in your core room it will help a lot.

Robeson Process Company

Grand Mere, P.Q.

Selling Agents:

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This Gravity Molding Machine



really is the only one on the market that completes a perfect mold automatically without stripping-plates or hand-work. You cannot afford to be without it.

WE ALSO CARRY

Jar and Squeeze Molding Machine.

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For Foundries, Blast Furnaces, Rolling Mills, Steel Plants, Cement and Lime Kilns, Glass Plants, Boiler Settings, etc.

IMMEDIATE SHIPMENTS
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LIMITED

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Often Imitated! Never Equalled!

Tallman's Reputation is in the Goods.

MANUFACTURERS OF

Finished Brass Goods
Brass Castings
Aluminum Castings

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Don't fail to mention "Canadian Machinery" in writing to advertisers.



A LIGHT POWER SQUEEZER FOR BENCH WORK

and a complete line of

FOUNDRY MOULDING MACHINES FOR ALL KINDS OF FOUNDRY WORK

Standard and Other Types to Suit Conditions

THE TABOR MANUFACTURING CO.

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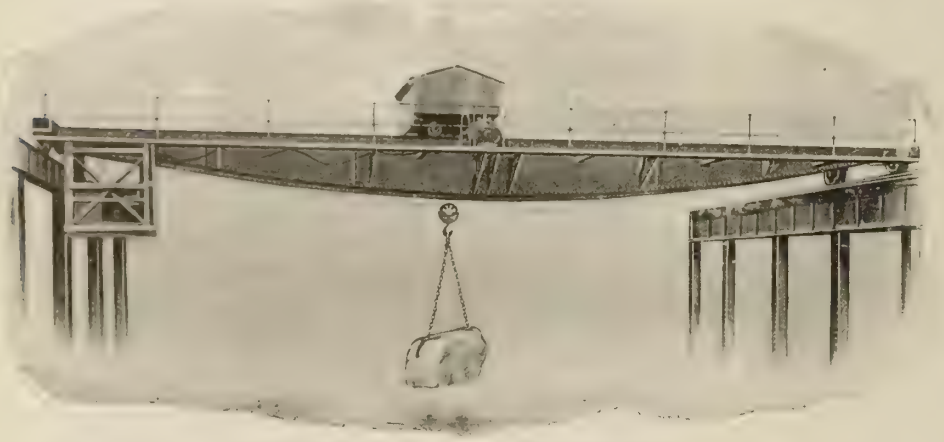


Photo of 5-ton Motor Traveling Crane, 60-foot span

Geo. Anderson & Co., Ltd.

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MONTREAL
and CARNOUSTIE, SCOTLAND.

Makers all sizes of

Travelling Cranes
Electric Derricks
Steam Derricks
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Four 20-Ton Electric Traveling Cranes, Foundry of Illinois Steel Co., South Chicago, Ill.

Whiting Electric Travelers and Cranes of all kinds

Constructed for Service

Scientific Design, First-class Construction, Improved Brakes, Movements under perfect control.

COMPLETE EQUIPMENT FOR FOUNDRIES

Grey Iron, Brass, Car Wheel, Pipe, Malleable and Steel.

Buildings Designed. Equipment Installed. Complete Plants Delivered to Purchasers Ready to Operate.

If it's Foundry Equipment, think of "Whiting"

WHITING FOUNDRY EQUIPMENT CO.

Manufacturers
Engineers
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BONNYSIDE FIREBRICK WORKS
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Best Scotch Firebricks

Special Grades for Blast Furnaces, Hot Blast Stoves, Steel Works, Brick, Lime and Cement Kilns, By-Product and Bee Hive Coke Ovens and Cupolas, Boiler Seating Blocks, Flue Covers, Dry Ground Fireclay, Foundry Ganister.

A.B.C., 5th Edition. Cables, "Ganister, Bonnybridge"

UNITED FIRE BRICK COMPANY
UNIONTOWN, PA.

HIGH GRADE FIRE BRICK, SILICA BRICK, SPECIAL SHAPES, AND DUST.

Special Brands for Foundry, Rolling Mill and Steel Plants, Cement and Lime Kilns, Glass Plants, Bee-Hive and Bi-Product Coke Ovens, Boiler Settings, Forge (oil or gas) Furnaces, etc.

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AVERAGE ANALYSIS
91% Carbon, 8% Ash and 65/100% Sulphur.
The analysis of contents of every car is shown on every invoice.

Insures Increased Melt
and Extra Fine Castings.

BAIRD & WEST
DETROIT
Sole Selling Agents Detroit Ovens.



The Making of Hollow Castings

The recent introduction of King Kore Kompound has now rendered this, once somewhat difficult, part of Foundry practice comparatively easy.

It has, also, reduced the core expense by more than one-half.

This compound is a black, dry powder, and is used as flour is used, but with one-half the quantity is produced greater and better results.

Its use avoids the danger of swelling or "blowing." The core easily comes out of the casting, and when old cores are ground up, in the rattler, or otherwise, the sand so made is used over again.

The core compound it contains, again becomes a binder under heat of the core oven, as it melts, and so it is used over and over again.

This is Foundry Economy; Flour, Rosin, etc., are now luxuries.

A barrel of King Kore Kompound will be sent "subject to approval" to any inquiring mind.

That is the **Stevens' System** of trying before buying.

I have copies of proportions of compound to sand used and methods followed in core rooms of Foundries in thirteen different States. This information, with other printed matter relative to the subject, will be mailed on request.

I maintain a direct branch at 137 Jarvis St., Mr. J. M. Mayers, Manager, Toronto, Ont., where is stocked a supply of **Foundry Facings, Foundry Supplies, Buffing Compositions,** of my own manufacture.

The stamp of quality pervades them all.

FREDERIC B. STEVENS

Main Office - - - - - - DETROIT, MICH.
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Give the workman the right wheel —right size – right grade—right grit —and insure maximum efficiency in your Grinding Department.

Carborundum Grinding Wheels

Do better, faster and cleaner work under more different conditions than any other grinding wheels ever made.

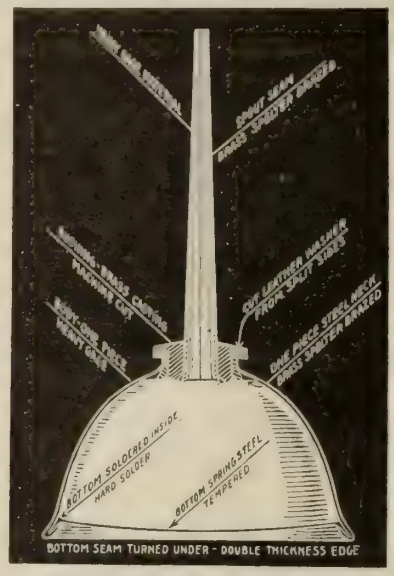
For instance, just to show the wonderful cutting powers—the versatility and durability of a Carborundum wheel, the foreman of a large machine shop ground a Novo high speed tool, a gray iron casting, a brass casting, a cast steel tool and a bar of bronze.

When the wheel was stopped it was found that there was no sign of glazing and the wheel loss was too small to be noticed.

Carborundum can do the same wonderful work in your shop. Let us know about your grinding and we will help you to get the right wheel in the right place.

The Carborundum Company
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The Oiler You Will Eventually Use Is



THE GEM BRAZED SEAM OILER
Practically indestructible.
Guaranteed to last.

Write for Booklet "Economy Oilers."

Gem Manufacturing Co.
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BROWNING LOCOMOTIVE CRANES

Are built to handle easily the heaviest lifting in logging, contracting enterprises, etc.

Economies of huge proportions are effected in every considerable undertaking, economies that spell profits in the final accounting.

We will gladly give you catalogues and estimates covering whatever work you may be performing.

BROWNING CRANES PERFORM WONDERS.

The Browning Engineering Co.
CLEVELAND : OHIO : U.S.A.

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PERFECT CASTINGS

Don't consider a casting like this to be useless—at a slight cost it can be made as good as the **best casting you ever made.**



Don't continue a needless waste. Consider what a saving there is on just one such casting as this. Then consider what a year's saving would be. Then try a can of **Shelton Metallic Filler**

No More Scrap Heap

No More Lost Profits

Shelton Metallic Filler

No More Delayed Shipments

No More Disappointed Customers



This illustration shows how a man saved the above casting from the "scrap-heap." A spatula, a little time, and a little Shelton Metallic Filler were all the requirements necessary to make it a highest quality casting.

Shelton Metallic Filler is guaranteed to fill in and completely obliterate blow holes, sand holes, etc. It becomes part of the casting itself, is durable, and can never be detected. It has been used with great success for many years. **Better write to us at once.**

SHELTON METALLIC FILLER CO
DERBY, CONN.

WE SPECIALIZE IN

High Speed Steel
AND
High Speed Tools

CONQUEROR IMPROVED
HIGH-SPEED **DRILLS**

made by twisting the rolled bar.
NO EXPENSIVE MILLING. NO WASTE of COSTLY MATERIAL
The natural fibre of the Steel remains undisturbed.

RESULT—
BETTER DRILLS, LESS BREAKAGES, LOWER PRICES



Write for Particulars to-day

A feature of these Drills is that no special holder is required. Shanks made to fit ordinary Morse Sockets

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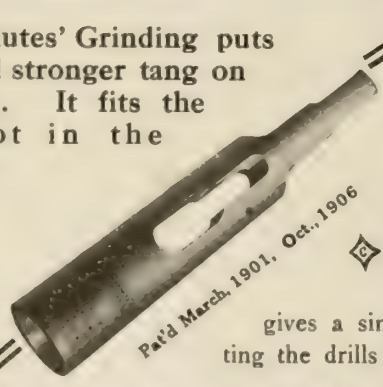
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are tools of Precision. They will do your work right, being scientifically made to meet modern requirements successfully.

Send for a "MORSE" Catalog, Illustrated, over 350 pages, free.

Morse Twist Drill & Machine Co.
New Bedford - Mass. - U.S.A.

Three Minutes' Grinding puts a new and stronger tang on the shank. It fits the lower slot in the socket.



What Do Your Twisted-Off Tangs Cost?

Keep account for a time of the new drills used to replace those thrown into the scrap heap because of twisted-off tangs, and you will see. These scrapped drills are all right in every other respect.

The "PERFECT" Double-Tang Socket

gives a simple, effective, and inexpensive means of eliminating this cost and putting the drills back in money-earning shape. **Write for Folder A.**

The CLEVELAND Twist Drill Co. CLEVELAND Chicago New York

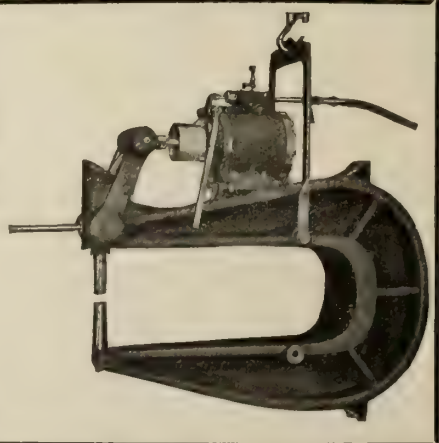
Buy an ALLEN PORTABLE PNEUMATIC RIVETER and be sure of the fastest and tightest riveting at the lowest cost

SEND for ILLUSTRATED CATALOGUE

Special riveters designed to meet all requirements.
"WHATEVER THE RIVETING, THERE'S AN ALLEN FOR THE JOB."

JOHN F. ALLEN COMPANY

Est. 1872
370-372 Gerard Avenue, NEW YORK
AGENTS—Canadian Rand Drill Co., Toronto, Halifax, Montreal. Liebers and W.U. Codes, Riveter."



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To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

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Cranes, Traveling, Electric and Hand Power.

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Cranes, Wrecking.

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Standard Tool Co., Cleveland, O

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Garvin Machine Co., New York

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Morse Twist Drill and Machine Co., New Bedford
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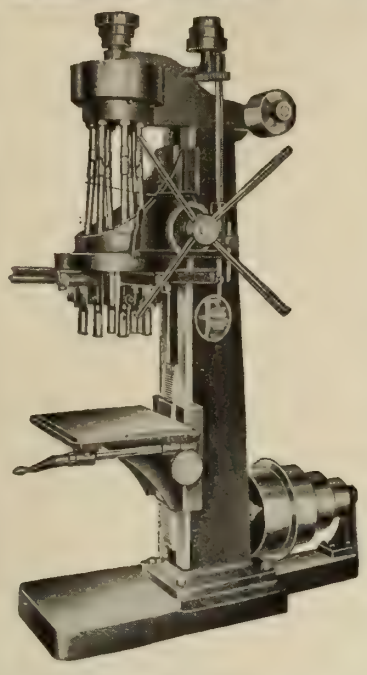
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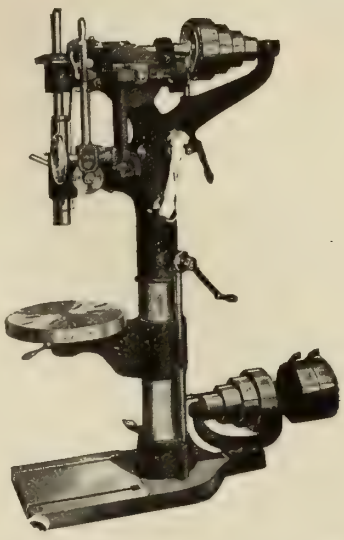
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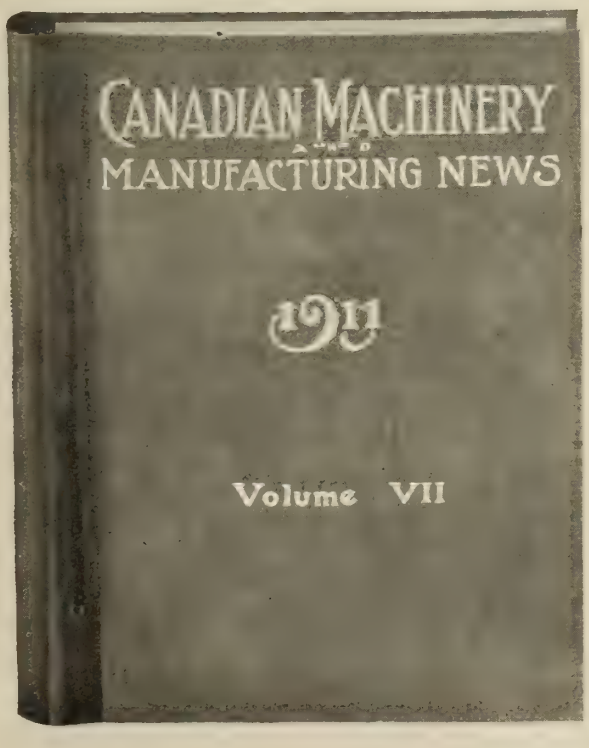
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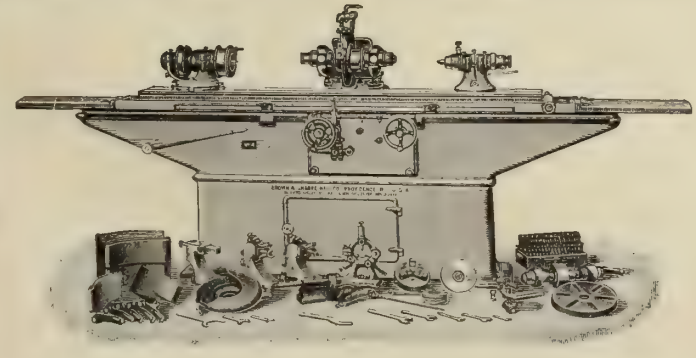
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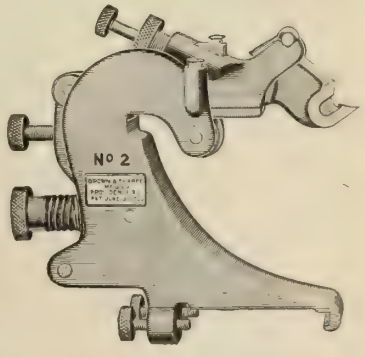


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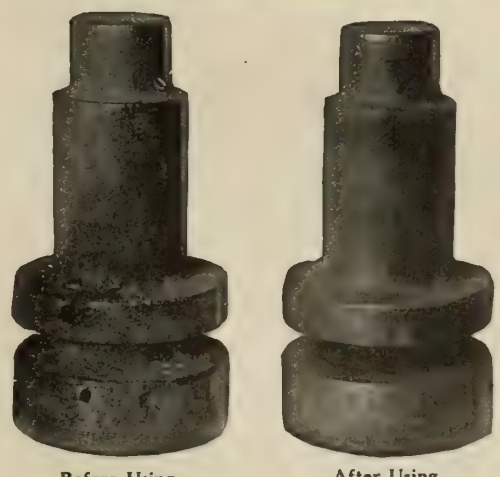
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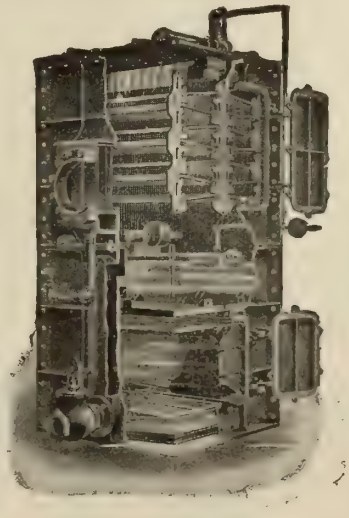
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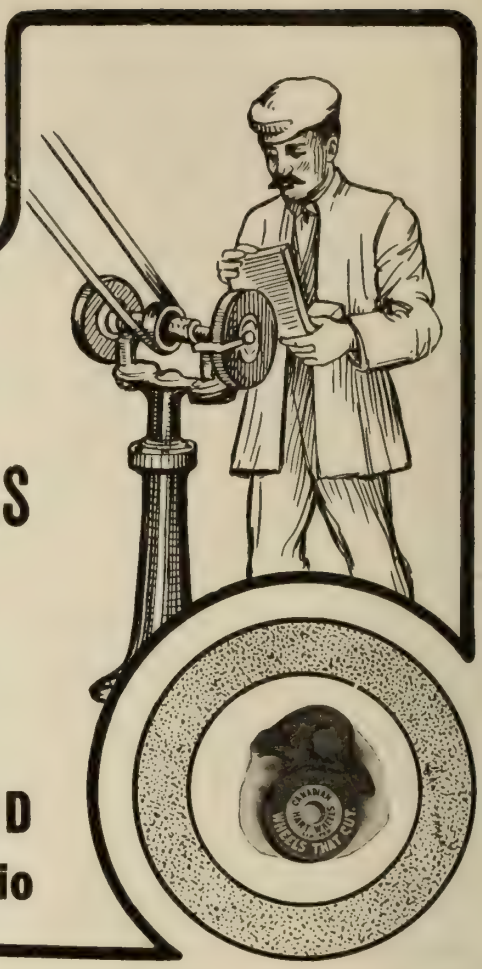
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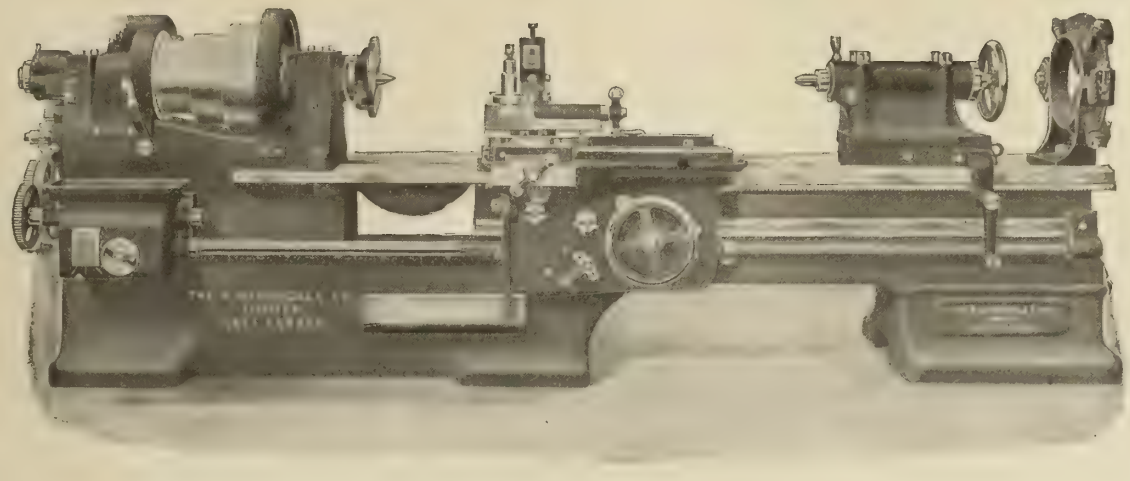
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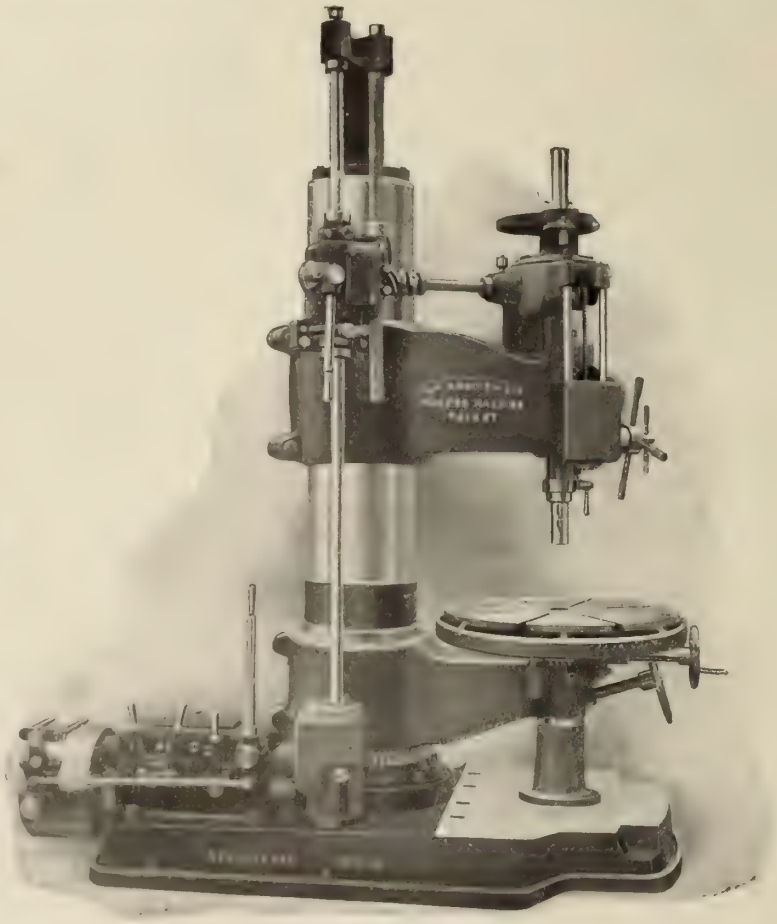
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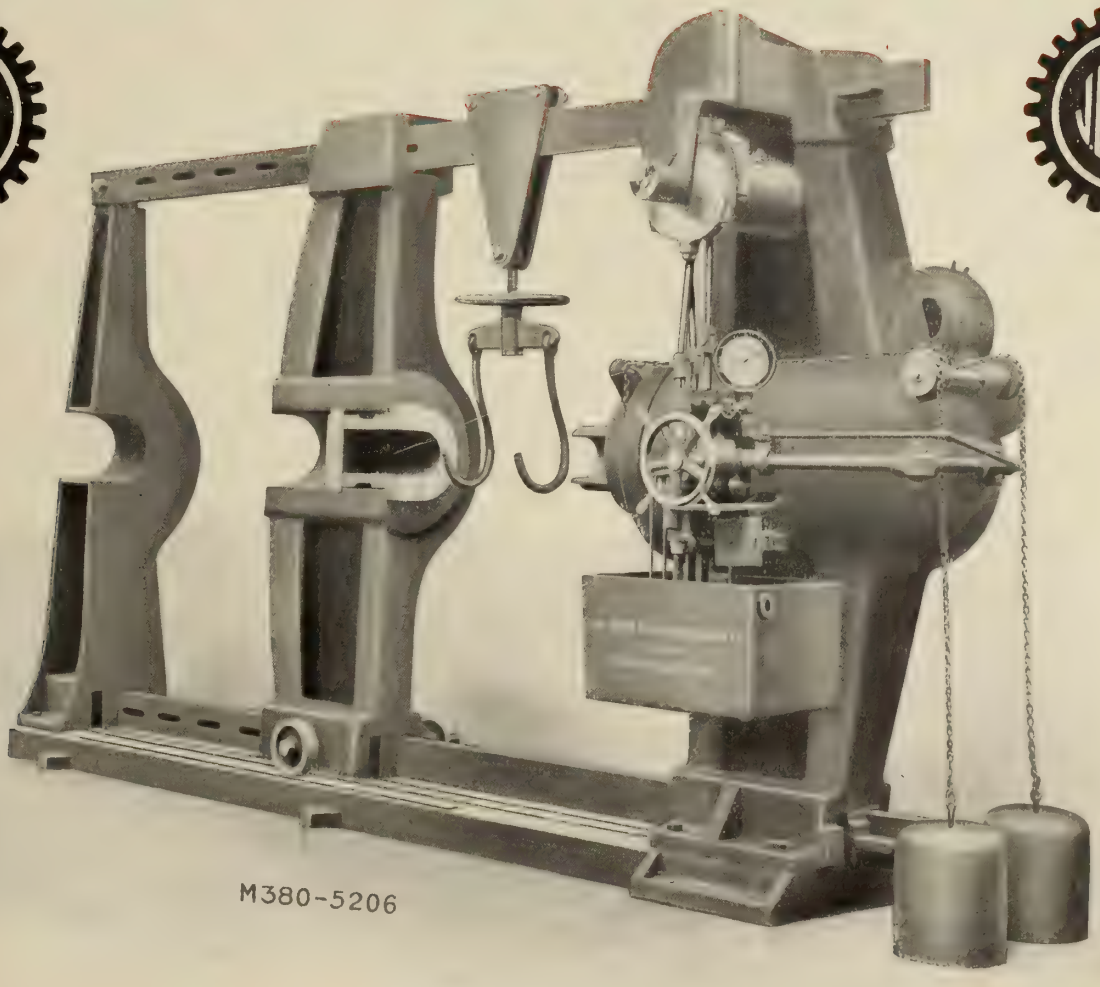
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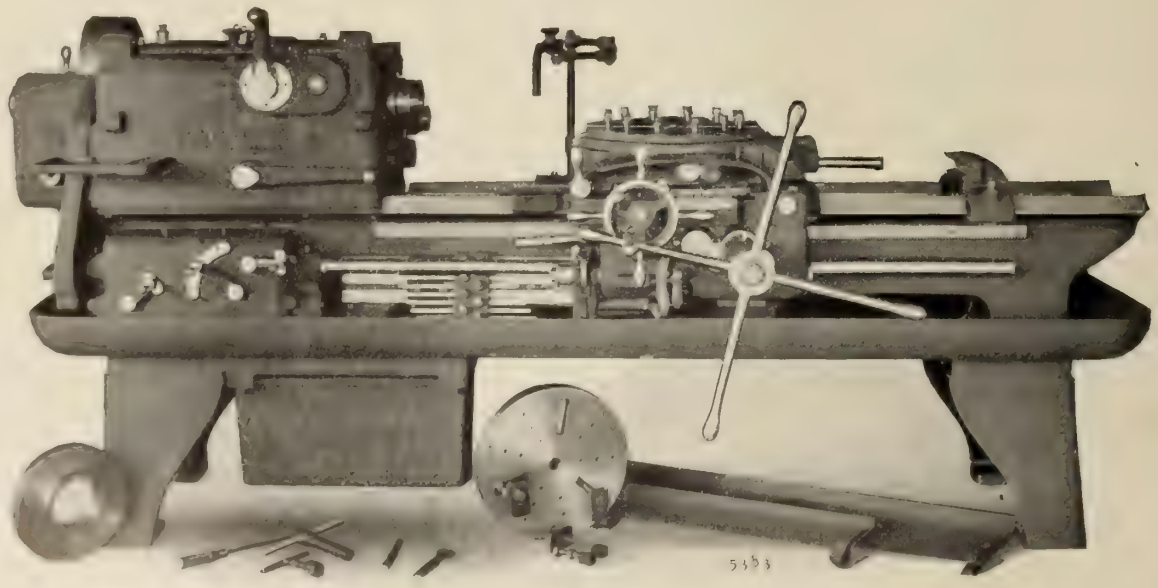
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They are made with eccentric flutes, the cutting faces being milled radial, so that the flutes are unevenly spaced and of unequal depth; consequently they make smooth, true holes; cut freely and do not chatter.

The steel of which they are made and the workmanship are both guaranteed to be of the best.

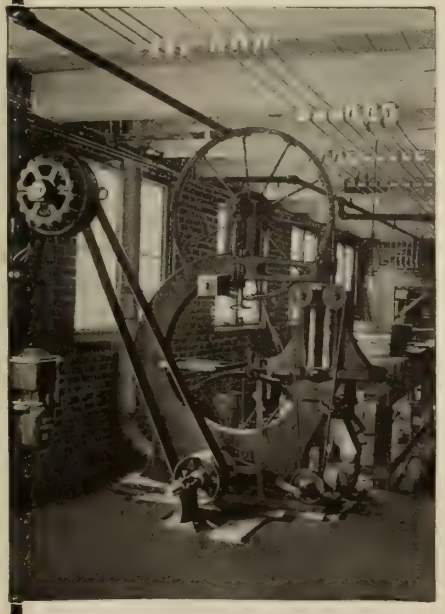
Our Catalogue No. 16 shows all kinds of Reamers, Drills and Milling Cutters. **Send for it and look it over.**

Office and Factory at Cleveland, Ohio
New York City Salesrooms at 94 Reade St.

STANDARD TOOL CO.

Do the right thing at the right time and you'll hold a good job;
Specify the right motors now, and save money in your factory.





"CCL" Motor Belted to Band Saw.

Westinghouse Type "CCL" Motors

are built for constant speed service on alternating-current circuits. They are of extremely simple construction, having no sliding contacts, and no wearing parts except the bearings which are capable of withstanding long and severe service with no attention other than occasional oiling.

Type "CCL" Motors may be used with perfect safety in locations surrounded by inflammable or explosive materials, as absolute freedom from sparking is assured.

The installation of Type "CCL" Motors in your factory will cut down your attendance and maintenance charges, reduce cost of operation, and increase your profits.

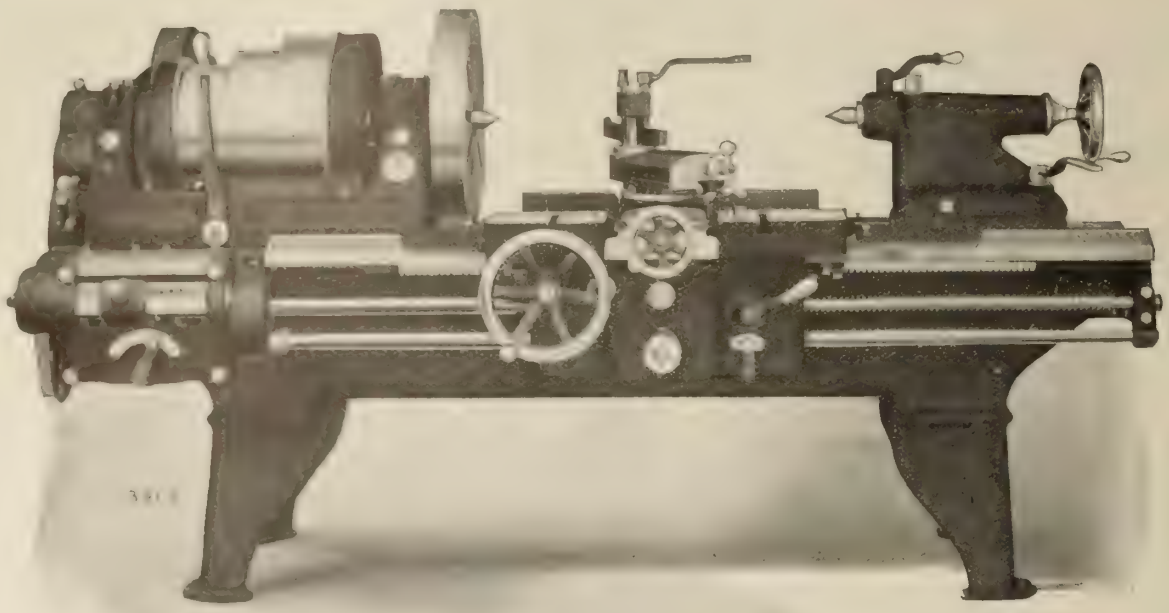
Begin to save money now. Send for Circular 1118.

Canadian Westinghouse Company, Ltd.

General Office and Works: HAMILTON, ONTARIO.

Address Nearest Office.

Toronto, Traders Bank Bldg.
Montreal, 52 Victoria Square
Halifax, Telephone Bldg.
Winnipeg, 158 Portage Ave., E.
Calgary, 311 Eighth Ave., W.
Vancouver, 439 Pender St.



Cost Reducing Features

An indestructible spindle bearing made of hardened steel and cast iron.

A head construction that gives more effective pulling power at the spindle than any other lathe built.

A patent "Compensating V" that permits four times the bearing area between the carriage and bed found on other lathes.

A carriage in which the tool thrust is taken on a bearing the entire length of the carriage, and which positively will not climb the V.

A double-walled one-piece apron which will last as long as the rest of the lathe.

A quick change gear complete in one unit, giving thirty-six changes with two operating levers.

An offset compound rest which can be used without skinning the operator's knuckles.

The centres set back of the middle of the bed, giving greater swing over carriage and permitting the turning of work up to the maximum swing without the tool overhanging the bed.

WRITE US FOR INTERESTING DETAILS.

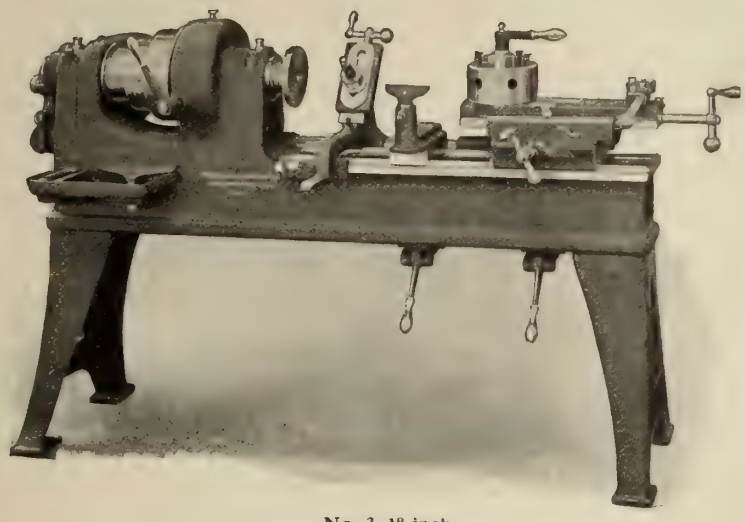
The London Machine Tool Co., Limited

HAMILTON, CANADA

Eastern Agents: Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que.

The advertiser would like to know where you saw his advertisement—tell him.

UNIVERSAL TURRET LATHES



No. 3, 18 inch

Universal Turret Lathes. Three sizes—16 in., 18 in., and 24 in.

These are excellent machines for general use, and for jobbing and repair work. They are rigidly constructed and the design and detail have been worked out to satisfy the most critical user.

They are adapted for a great variety of work, and large and small lots, and are capable of handling it rapidly.

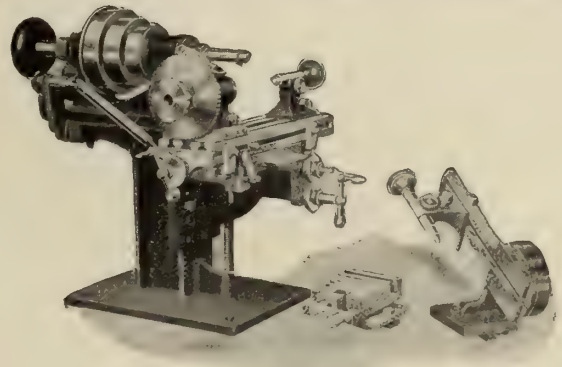
Send samples or blue prints and let our Engineering Department estimate on the output.

Hollow Hexagon Turret Lathes. Turret Screw Machines. Brass-working Machine Tools.

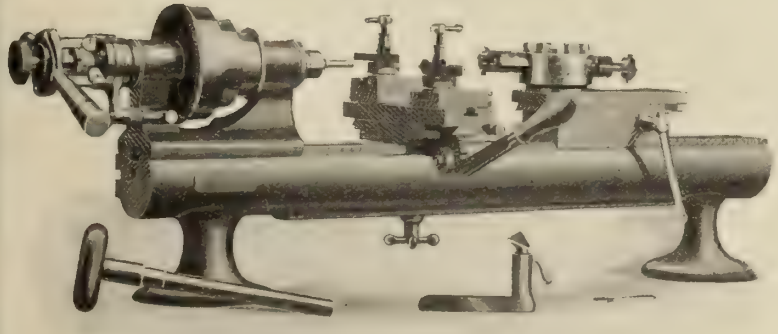
THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO, U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams and Wilson, Montreal



Write for Catalog No. 190.



The Hardinge Bench Miller

will do work which cannot be handled on Standard Large Milling Machines, and will do some of the work now being done at a loss on large machines.

AS YOU LIKE IT

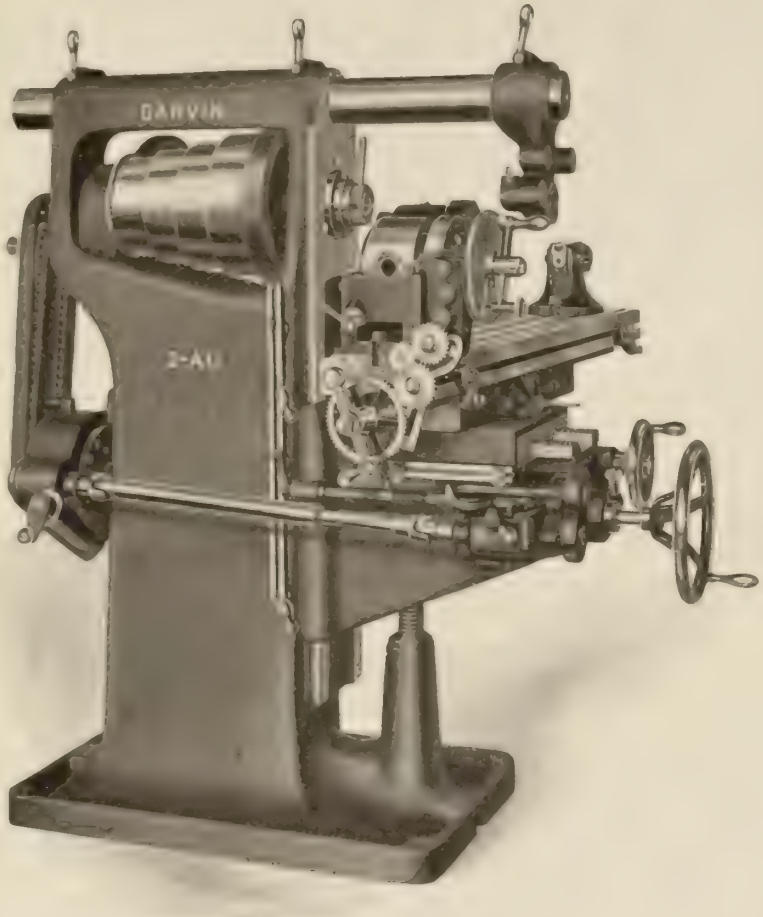
A Bench Lathe, or a Screw Machine, with Automatic Chuck Closer, Double Tool Cross Slide and Turret. Drill, Tap and Die Holders carried in stock.

Hardinge Bros. Inc.

3133-3141 Lincoln Avenue
Chicago - Illinois

GARVIN No. 2-A (ALL FEEDS)
Universal Milling Machine

IS THE MACHINE FOR YOUR TOOL-ROOM.—RIGID AND ACCURATE



GARVIN NO. 2-A Universal Milling Machine
(Automatic Feeds in all Directions.)
Use Code.....ANIMUS.

Power Feed with reverse and automatic trip is provided in all directions, table, in and out and up and down. The feed movements are all controlled by one handle with which the knee, saddle or slide can be started, stopped and reversed. The table has an independent trip handle in addition.

Ten Positive Feed Gear Cbanges are secured, doubled to twenty when back-gears are used. The accelerated feed of table is received, when large diameter cutters are being used and the spindle is running slow. The Feed can be changed while machine is in cut.

Machine is equipped with our Double Geared Dividing Head, our

SOLID TOP EXTENDED (Patented) KNEE

and many other valuable features exclusive to GARVIN Milling Machines.

DIMENSIONS

Automatic Table Feed	25 in.
Automatic Feed of Saddle	8 in.
Automatic Feed of Knee	18 in.
Dimensions of Table over all	48x9 in.
Taper Hole in Spindle B&S (Positive drive)	No. 10.
Width of Belt required	3 in.
Number of Speed Changes	16
Number of Feed Changes	20
Floor Space required	74x84 in.
Crated Weight	3,500 lbs.

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

Send for Descriptive Circular No. 159

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

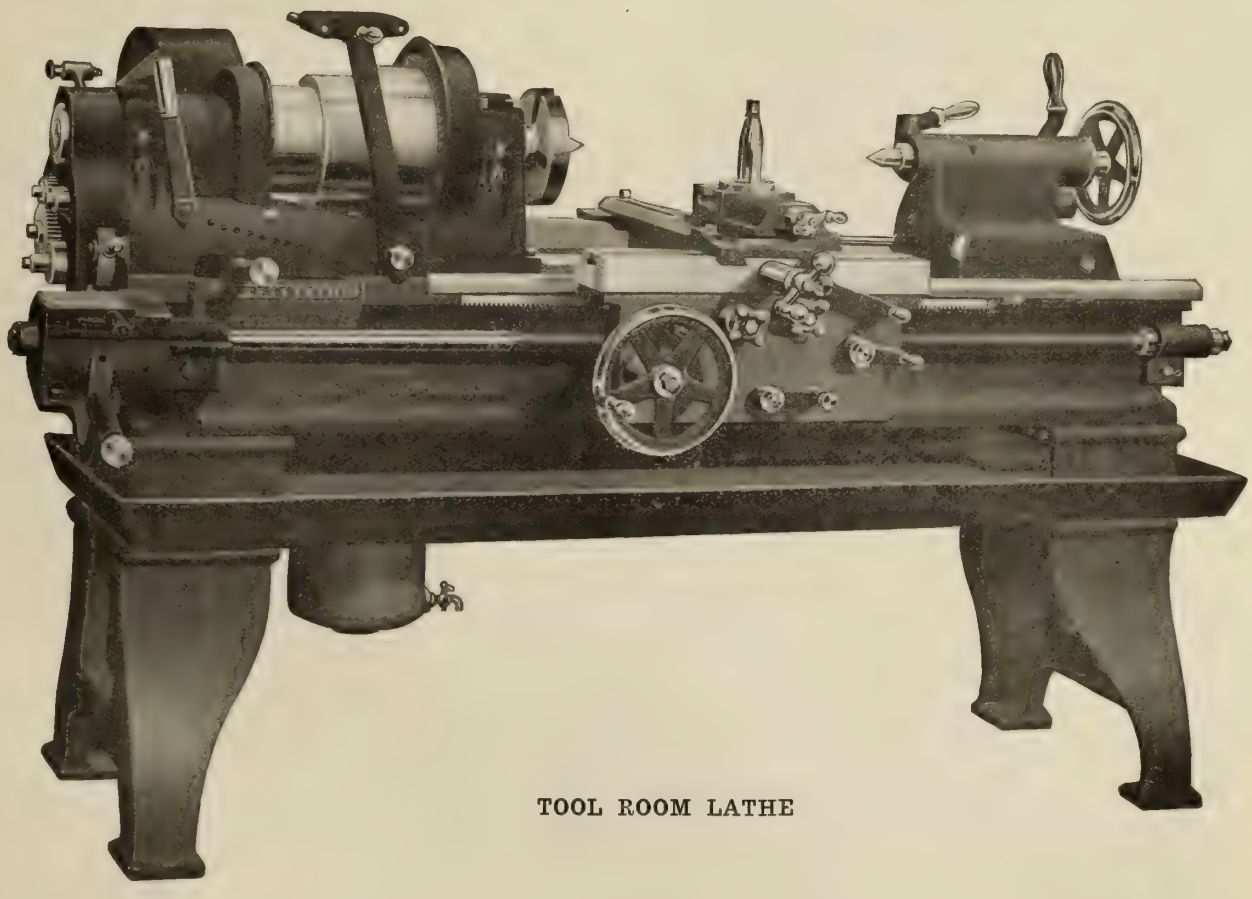
MANUFACTURERS OF Visitors Welcome.

Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Hole, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.

CANADA MACHINERY CORPORATION, LIMITED

Lathes, Shapers, Planers, Slotters, Punches, Shears

Latest Designs, Finest Workmanship



TOOL ROOM LATHE

Note the appearance of this machine. Hundreds of them in use, and every one giving satisfaction. One grade only and that the best.

Write for Catalogue.

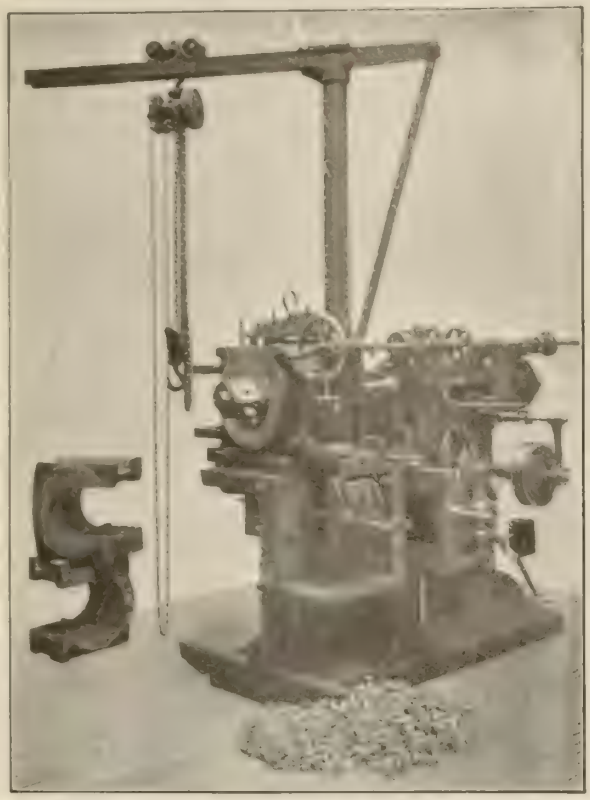
PRICES AND BULLETINS ON APPLICATION.

Canada Machinery Corporation, Limited

GALT, ONTARIO

Don't fail to mention "Canadian Machinery" in writing to advertisers.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1" to 6 inch pipe; Bolts to 2 inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2"; ½" to 3"; 1" to 4"; 1½" to 6"; 2" to 8" and 3½" to 12".

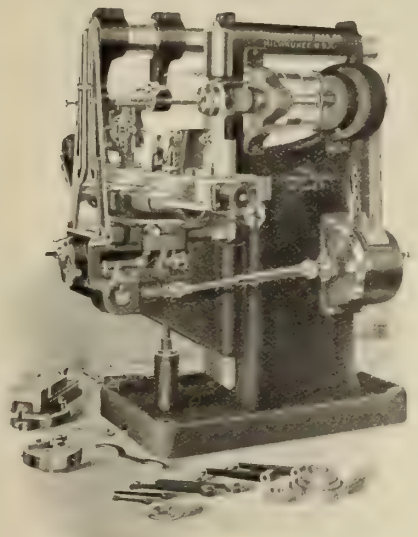
Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

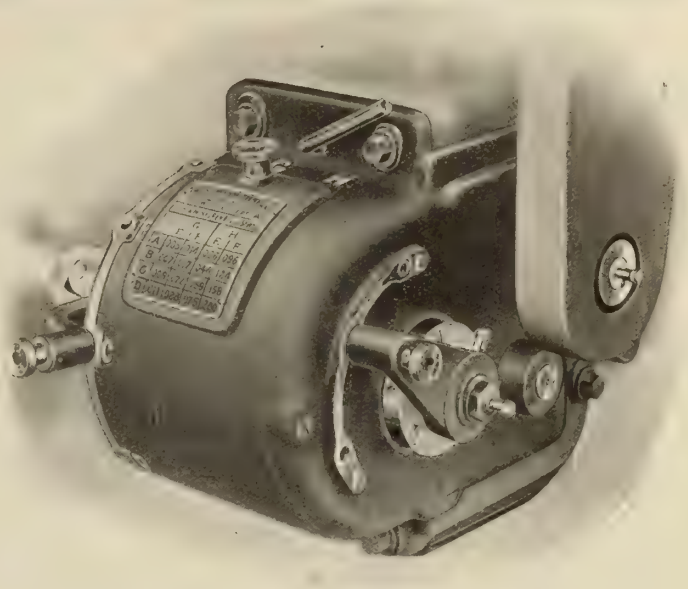
Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

The every-day operation of the milling machine depends much on the character of the feed-changing and feed tripping mechanism, and the table operative features.





The high development of these on

KEMPSMITH

MILLING MACHINES

is an indication of their general excellence

THE KEMPSMITH MFG. CO, MILWAUKEE, WIS.

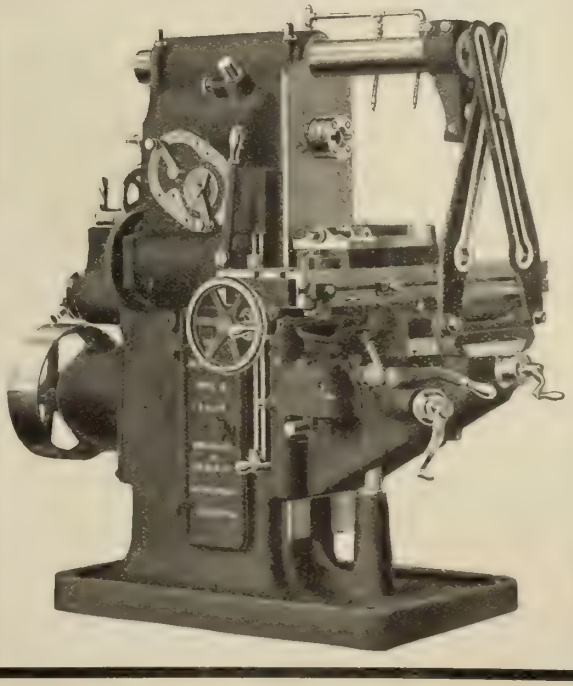
Canadian Agents: The Rudel-Yeates Machinery Co., Montreal, Que.

KEARNEY & TRECKER CO.

Manufacturers of

Milwaukee Milling Machines

MILWAUKEE, Wis., U. S. A.



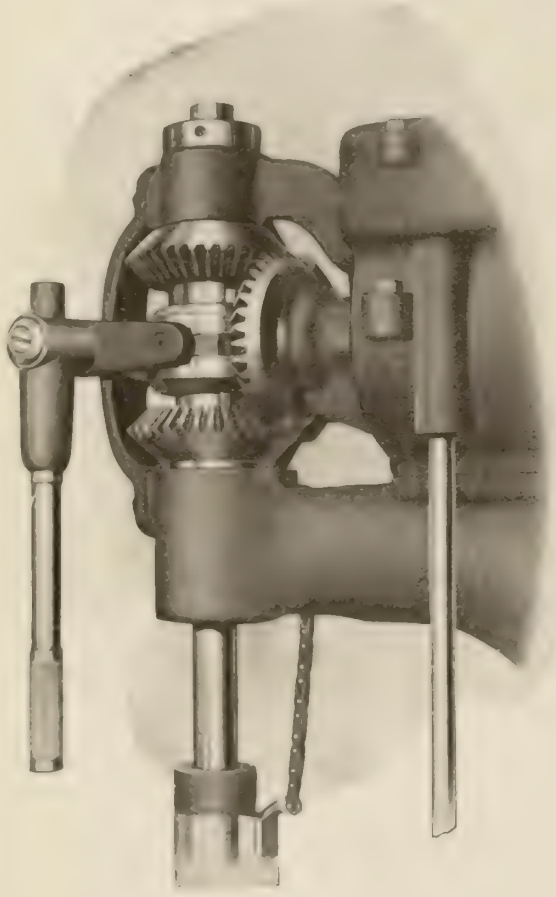
OUR DESIGN MAY NOT BE THE BEST

but we think it is and have attempted a justification of our belief in 1911 catalog now ready.

Canadian Agents:

A. R. WILLIAMS MACHINERY CO., Toronto, St. John, Winnipeg, Vancouver; WILLIAMS & WILSON, Limited, Montreal.

Tapping Attachment *for* Sibley Hi-Speeds

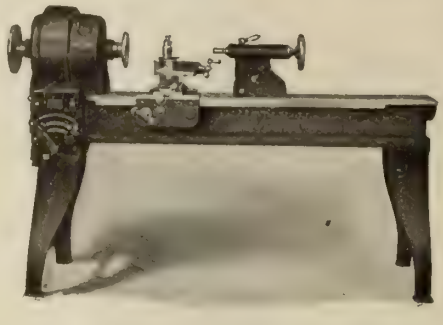


Shown with gear guard removed

Sibley Machine Tool Company

Church Lane
South Bend, Ind., U.S.A.

Motor Headstock Speed Lathes and Pattern Makers' Lathes



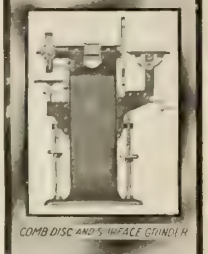
This lathe is a model of compactness and adaptability to patternshop requirements. Patented improvements in the field design give the motor an exceedingly wide range of speeds. The motor is placed on the bed of the lathe, adding to its superior convenience. Armature and commutator are mounted directly on the spindle, which is journaled in taper bronze bearings, with convenient adjustment for taking up the wear, and end thrust. The entire outfit is incorporated into the design of the lathe, which can be placed in any position desired.

Fay & Scott, Dexter, Maine, U.S.A.

Makers of Engine, Extension Gap, Facing, Chucking and Turret Lathes, Special Turrets for Lathes of any make, and Planer Centres

Canadian Agents—Williams & Wilson, Montreal, Que.; A. R. Williams Machinery Co., Toronto; A. R. Williams Machinery Co., Winnipeg; General Supply Co of Ottawa, Canada.

GRINDER LINE



COMB DISC AND SURFACE GRINDER



NO. 2 GRINDER



COMB WET





TAIN LEADERS

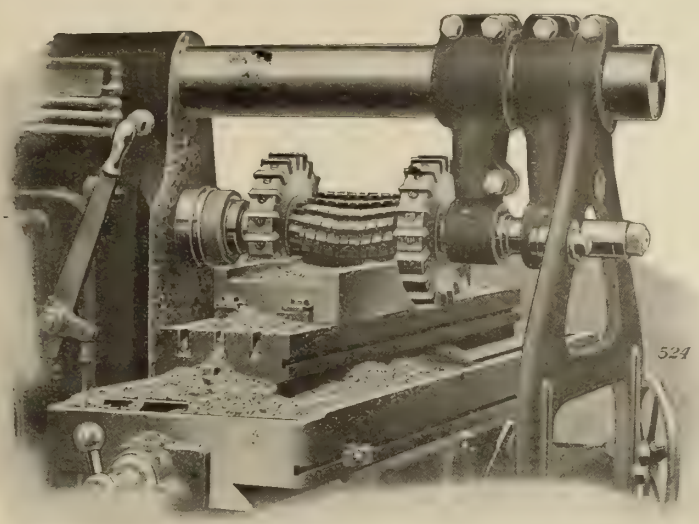
The Valley City Combination Disc and Surface Grinder

is an especially advantageous machine for the pattern shop and for all kinds of tool and surface grinding. The very substantial construction, body of machine one solid casting, eliminates vibration and contributes to accurate product. All conveniences—rapid adjusting screws, tilting table, micrometer adjustment for upper table, rest for tool grinding—a complete and efficient machine.
Full line includes Wet and Dry Grinders, Combination Machines, Buffing and Polishing Machines.

Send for Catalogue.

Valley City Machine Works
20 Compau Street, Grand Rapids, Mich.

NINETEEN CUBIC INCHES PER MINUTE



THE total width of surface roughed off at one cut on these gray iron castings is 16½ inches—maximum depth of cut 3-16 in.—length of cut on each piece 8¼ in.—largest cutters 10½ in. diameter, running 21 rev.—6.3 feed.

The pieces are held in a string jig, removed as fast as traversed by the gang and others chucked in their places.

The pieces are made in lots of 125 at a time and an entire lot is regularly milled on a No. 4 Plain High Power Cincinnati Motor Driven Miller at this enormous rate without stopping to sharpen the cutters.

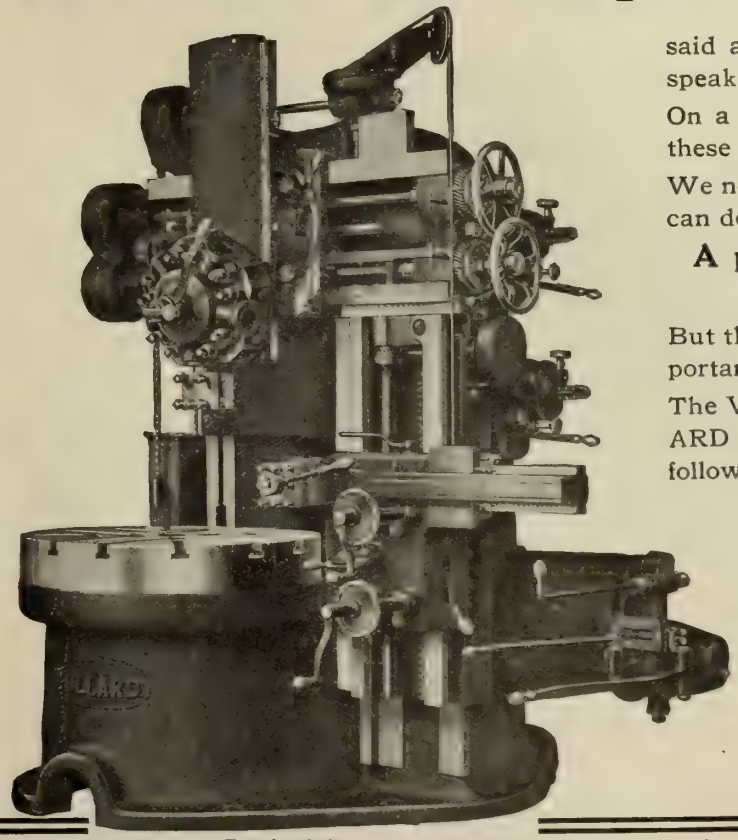
It takes a powerful, rugged machine to do such milling, and it must go through without vibration—otherwise the cutters would be dulled, forcing a reduction in the feed, long before an entire lot of pieces is finished. Our machines are designed for this kind of service.

Ask for our Complete Catalog

The Cincinnati Milling Machine Co., Cincinnati

Canada Agents: H. W. PETRIE, Limited, Toronto, Montreal and Vancouver

"It Has Keyed Up the Whole Shop"



said a prominent Pennsylvania manufacturer, in speaking of the Vertical Turret Lathe.

On a four-foot Boring Mill we formerly did 3 of these pieces in a nine-hour day.

We now get 13 pieces a day from THIS machine and can do better.

A production increase of 425%; a cost reduction of 76%

But there is more to the story than that—more important, perhaps.

The Vertical Turret Lathe has set a new STANDARD in that shop—a faster pace, unconsciously followed by EVERYONE, has been set—"It has keyed up the whole shop!"

Distinctive structural and operative features are responsible for this result.

It is to your interest to know about them.

Let us send you Catalog C-15, which goes into full details.

The Bullard Machine Tool Co.

BRIDGEPORT, CONN., U.S.A.

Suit for Infringement

brought by this Company against The Universal Machine Screw Company, of Hartford, Conn., has been settled out of court by the payment of royalties for past infringement and the expenses of the action by the Universal Machine Screw Company to the National-Acme Manufacturing Company.

A non-exclusive license has been issued to The Universal Machine Screw Company under which it may continue to build, use and sell Multiple Spindle Screw Machines, embodying the subject matter of the letters patent which were infringed, in consideration of the payment of a royalty on all machines so built, to this Company.

The National-Acme Mfg. Co.

Factories :: MONTREAL - CLEVELAND

Branch Offices New York, 77 White st. Boston, 141 Milk St. Chicago, 549 Washington Blvd. Detroit, 1224 Majestic Bldg. Atlanta, Candler Bldg. Montreal, St. Elizabeth St. and G.T.R.

General Foreign Representatives Alfred H. Schutte, Cologne, Paris, Brussels, Liege Milan, Madrid, Bilbao Barcelona Schuchardt & Schutte, Berlin, London, Vienna, Stockholm, St. Petersburg, Copenhagan, Budapest, Shanghai.

POWER PUNCHING AND SHEARING MACHINERY

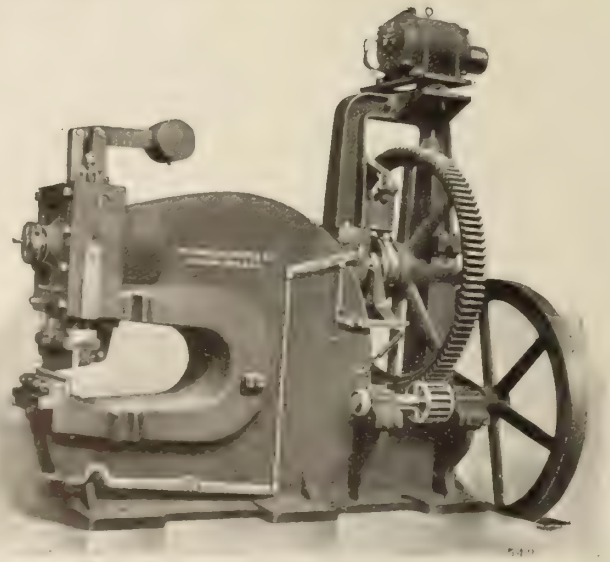
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications.



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

Tire Bending Rolls.

Bending and Forming Machines.

Drop and Helve Hammers, Etc., Etc.

Designed and Manufactured by

THE LONG & ALLSTATTER CO.

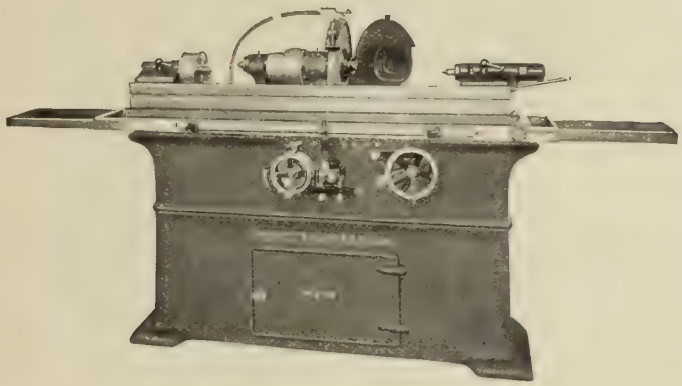
Hamilton, Ohio, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

LOOK UP CAREFULLY the new Operative Features of the

MODERN PLAIN GRINDER

BEFORE YOU PLACE YOUR ORDER ELSEWHERE



Look over the compact lineup of this Grinder, the simplicity and accessibility of the operative parts, and think how carefully the whole design has been worked out even to the smallest details. We can show you some interesting improvements, designed to meet modern grinder requirements. Besides this our demonstrator is at your service to assist you in getting production and accuracy.

Users of our Grinders are getting results

Let us show you how you can get production with accuracy.

Write for Catalogue

MODERN TOOL COMPANY

3rd and State Streets **Erie, Penna., U.S.A.**

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

A NEW
HOLLOW CHISEL MORTISER



No. 272 Vertical
Hollow Chisel Mortiser

Will do as clean and accurate work up to ¾" square and 6" deep as a big heavy tool. Easy and simple to operate. Entirely self-contained—taking up small space and using little power. Automatic disappearing stops eliminate the necessity of marking off stock in duplicate work. Works smoothly; no pounding or jarring. Table angles 40 degrees. Under instant control of operator.

At the exceptionally low price we are selling this tool it will pay for itself in a short time. It is the only machine of its kind now made.

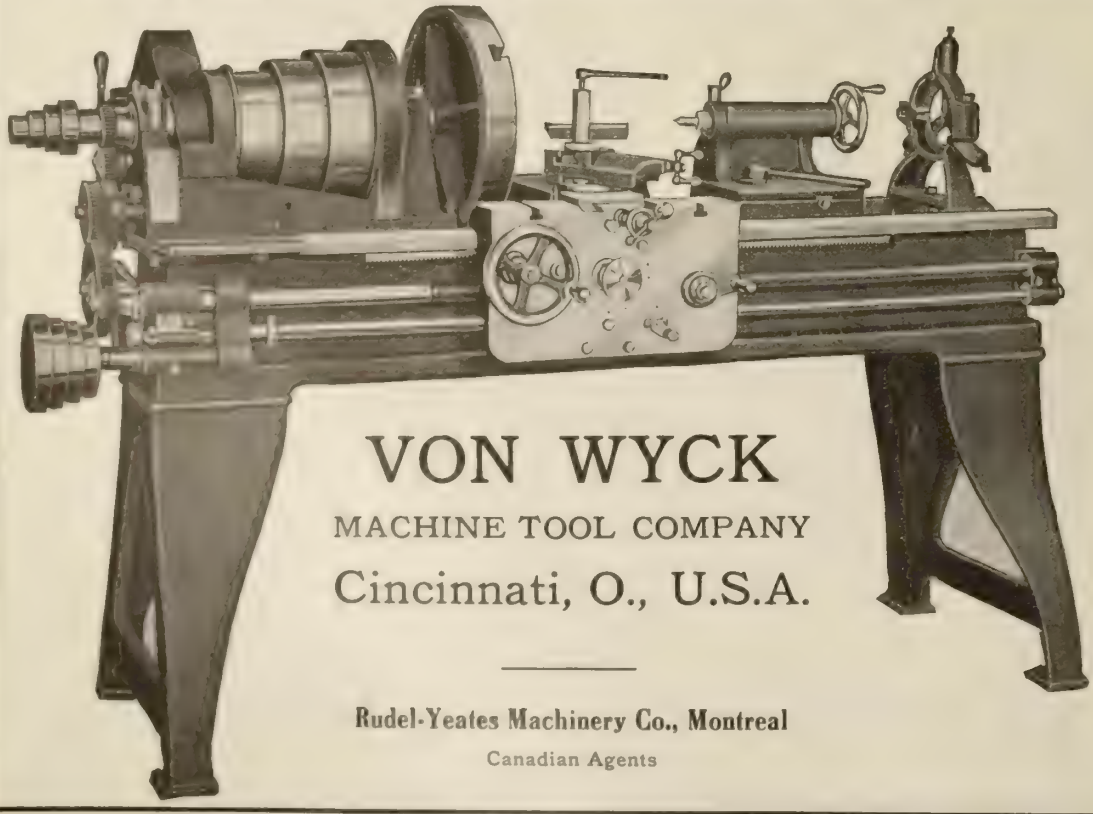
Price and details free upon request
Write to-day

J. A. FAY & EGAN CO.

362-382 W. Front Street, - - - Cincinnati, Ohio

A High-Grade Small Engine Lathe at Moderate Cost!

With or Without Quick Change Gear Device.—Three or Five Step Cone. You can use one in YOUR shop.



VON WYCK
MACHINE TOOL COMPANY
Cincinnati, O., U.S.A.

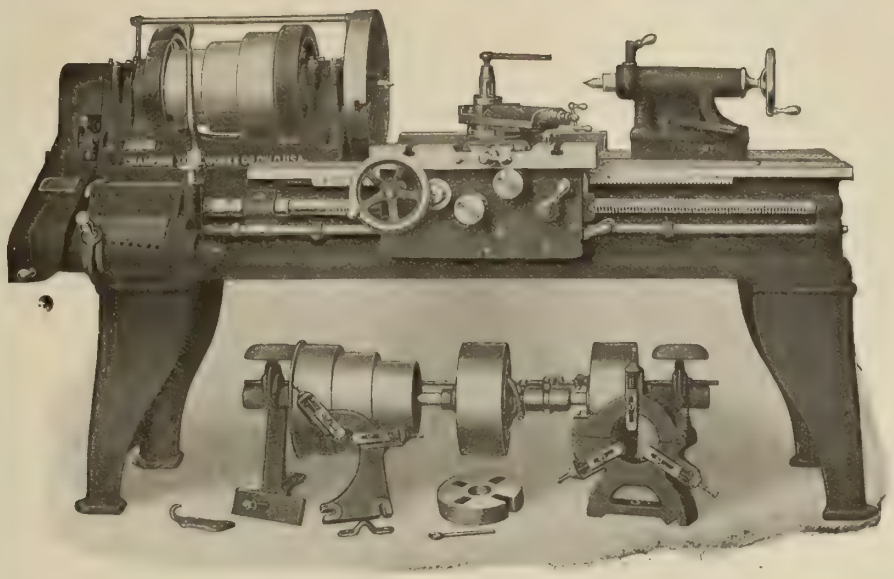
Rudel-Yeates Machinery Co., Montreal
Canadian Agents

FREE from fussy attachments and mere talking points, the Von Wyck 15-inch engine lathe offers such a combination of convenience and economy that operators maintain, "It is unequalled by any lathe of its swing."

WHY buy a large size and pay a big price to get great strength and efficiency? Von Wyck design and construction are thoroughly high grade in every important detail and satisfactorily cover an unusual range of work.

The advertiser would like to know where you saw his advertisement—tell him.

CHAMPION LATHES an incentive to increased output.



16-in. Quick Change and Double Back Gear Lathe.

We all know how the Machinist prefers the convenient Tool. It not only lessens his labors, but enables him to get at his work with greater dispatch and satisfaction.

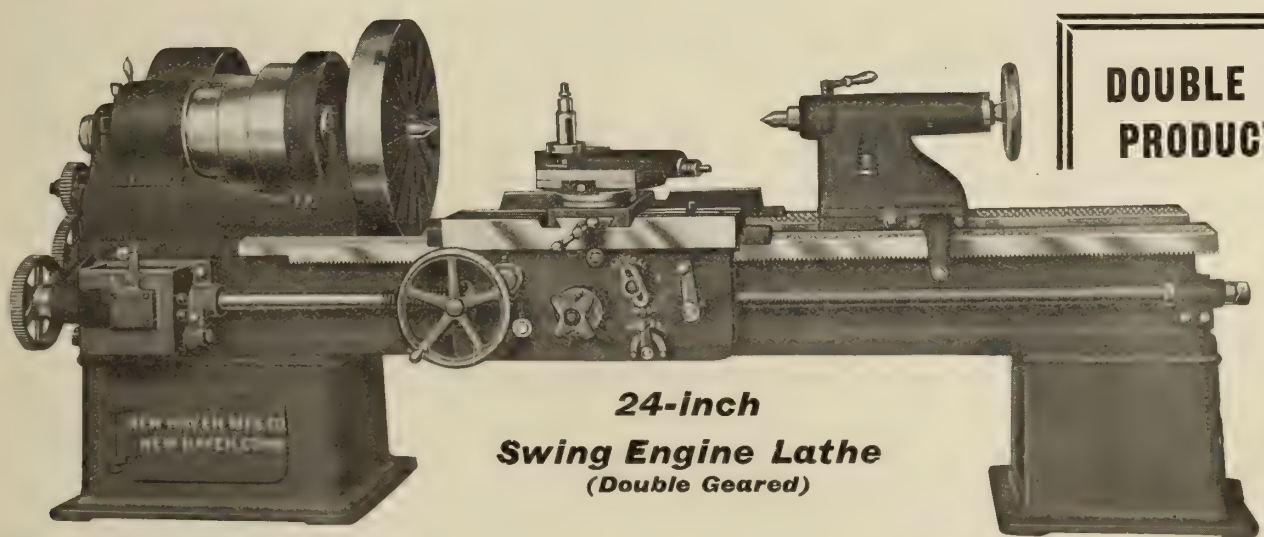
The convenient form of Double Back Gear here shown for changing instantly from Low to High Gear or vice versa by simply shifting the vertical lever and without stopping the lathe or leaving his working position in front of the machine is a convenience which should not be overlooked in your next Lathe Order.

The **CHAMPION** Patented Positive Clutch Type Double Back Gear Lathe is the best.

Read the Details in our Catalogue of 10-12-14-16 & 18-inch Lathes.

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.



DOUBLE YOUR PRODUCTION

24-inch

Swing Engine Lathe

(Double Geared)

NEW HAVEN LATHES

You can easily understand the reason why New Haven Lathes have taken first place in their class.

Easily operated, perfectly accurate, frictionless and powerful, they turn out the work to your satisfaction with decreased effort and time.

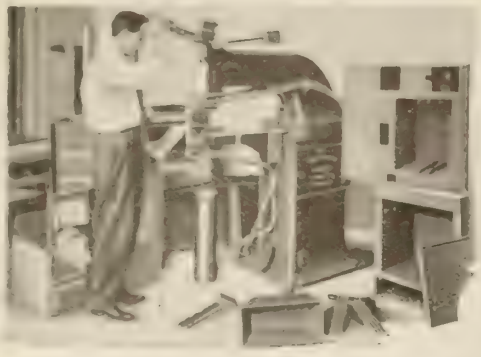
Every NEW HAVEN LATHE is covered by an absolute guarantee of continuous, satisfactory service. We make your interests ours. **Write for catalog of New Haven Tools.**

New Haven Manufacturing Co.

NEW HAVEN, : : : : : : CONN., U.S.A.

One Man Says:

No more Riveting for him. It's too slow—too expensive.



This is the machine he uses.

He has tried "SPOT WELDING." It takes the place of riveting.

No Holes to Punch. No Rivets Used.

It's the Electric Way.

Place two pieces of sheet steel between the copper die points; touch the switch; let go. The job is finished, and a stronger, neater, cheaper job than can be made with rivets.

We manufacture over forty types and sizes of Welding Machines—Butt Welders, Spot Welders, Tee Welders, Jump Welders, Point Welders, Automatic Welders. and plain, every-day welders.

Let us tell you about them. Catalogue and free sample for the asking.

The "Toledo" Electric Welder Co.

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

INCREASE

Your Output by Using the

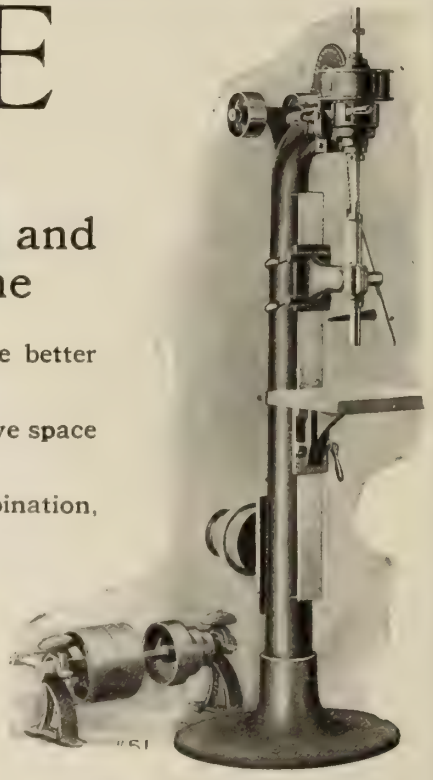
"BARR" Combined Drilling and Tapping Machine

Why buy two machines when ONE will serve your purpose better than TWO separate machines?

The "BARR" will turn out more work economically and save space and labor.

They have Power Feed, Lever Feed, and Tappers in any combination, two to seven spindles to a machine.

Give the "BARR" a trial and you will use it exclusively.



Write for information.

H. G. BARR, Worcester, Mass., U.S.A.

WILLIAMS & WILSON, Montreal : : : : Agents for Eastern Canada

The advertiser would like to know where you saw his advertisement—tell him.



IN STOCK

—all these SHELBY SEAMLESS STEEL TUBES, drawn cold, through dies, like a piece of wire. Notice the smooth little round ones, the sturdy big ones; the thick and the thin ones, as well as the squares, rectangles, hexagons, ovals and odd shapes; then think how much time, how much temper, and how much REAL MONEY you could save by the use of this excellent material instead of machined steel, or cast iron, or brass.

Fifteen years ago you couldn't buy these tubes, because we didn't know how to make them. Now we will furnish you any size from ⅛ to 5½ inches outside diameter, and practically any thickness, from

Our Montreal or Toronto Stocks

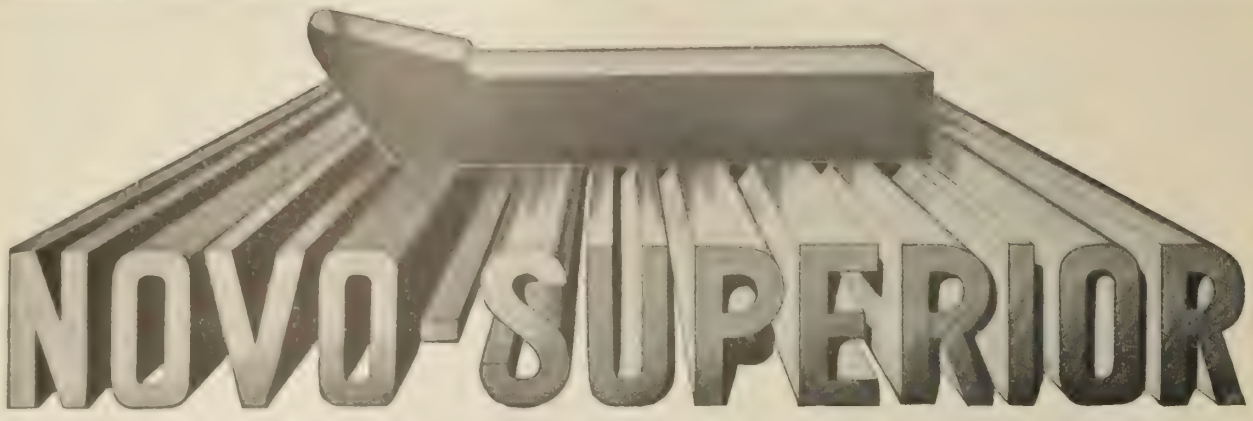
and larger sizes up to 20 inches, on special orders. We have tubing with walls as thin as a business card, some so thick there's hardly room for a hole. We have tubing made from mild steel, and annealed for any particular purpose; also high carbon steel for bushings and special tensile requirements. We sell tubing from 3½ per cent. Nickel Steel for automobile construction. In a word, if there's *anything* you want in steel tubing, we have it, or can get it.

Look at the picture, which shows only a few of the sizes and shapes we carry, think how you could use Seamless Tubing in your work, then send for the story of how SHELBY TUBING is made. There are more possibilities for the use of this tubing than we could tell in a book. Write us—we will be glad to answer your questions.

JOHN MILLEN & SON, LIMITED

MONTREAL TORONTO WINNIPEG VANCOUVER

Address all Correspondence to 321 St. James Street, Montreal.



High Speed Steel Has a Solid Foundation In a Name That Means Something

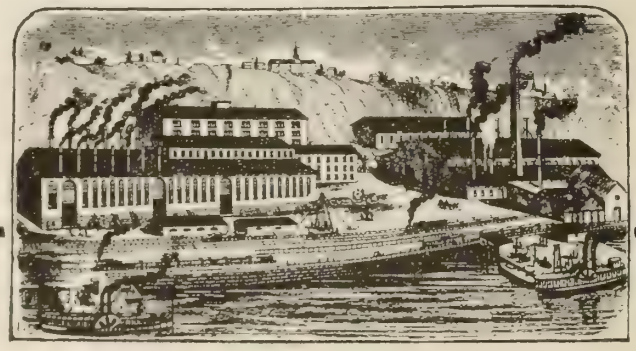
Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND CONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL

MARINE ENGINES and PUMPS. SHOE MACHINERY A Specialty



BRASS and IRON CASTINGS. BOILERS and REPAIRS.

That we have exceptional facilities at our disposal for the manufacture of all kinds of Machinery—in addition to our business as Brass and Iron Founders, General Contractors and Shoe Machinery Engineers—has been amply proved this year. In the short space of five months, we built and installed all the Engines and Boilers of the new sister steamers "Levis" and "Lauzon," whose trial trips were a complete success. We make a specialty of all kinds of Marine Engine Work, and shall be glad to quote for first-rate products only.

SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

Wire of every description for Slugger and Standard Screw Machines.

The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director
LEVIS, Quebec

The advertiser would like to know where you saw his advertisement—tell him.



ACCURACY

To make Twist Drills that will do absolutely accurate work requires the greatest skill—years of experience and the most careful attention to each detail of manufacture.

To secure the greatest wearing quality requires the best of steel, tempered to exactly the correct degree of hardness. Not all Twist Drills attain these two essentials, but

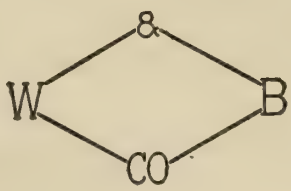
"W & B-DIAMOND"

Twist Drills do and we ***guarantee*** them to be of ***highest quality*** and ***accurate to size.***

We make them from Carbon Steel and Vanadium High Speed Steel and carry the largest stock in Canada.

The "Hercules" High Speed Twist Drill shown on this page is one of our many types and is ***twisted*** while hot from Vanadium High Speed Steel.

Write for Catalog No. 74



TRADE MARKS



The WHITMAN & BARNES MFG. CO.

ST. CATHARINES, - ONTARIO

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

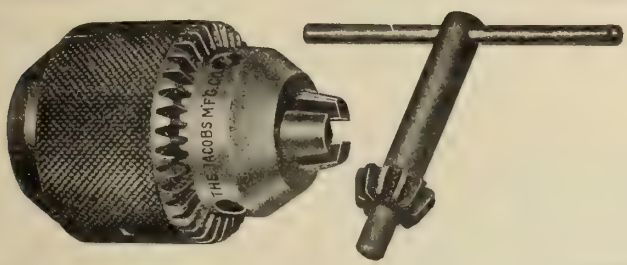
REPRESENTATIVES

L. F. McClernan
1243 Peoples Gas Bldg.
CHICAGO

L. F. McClernan
1417 Ford Bldg.
DETROIT

L. D. Rockwell
U.S. Express Bldg.
NEW YORK

FREE!



ONE Jacobs Improved Drill Chuck No. 2 sent FREE to your address upon receipt of a letter from you, written on your business stationery, making positive statements as follows:

First—That you are in the machine business for yourself;

Second—That you use in your factory, or shop, as many as four Drill Chucks;

Third—That you do not use the Jacobs Improved Drill Chuck;

Fourth—That you saw this offer in the June issue of Canadian Machinery;

This offer is positively good only until July 1, 1911.

This is No "Gold Brick Offer"

It means dollars and cents to you. More than 105,500 Jacobs Improved Drill Chucks have been purchased. More than 1800 were purchased during the month of March, 1911. *A consumer never purchased one of these Chucks from us for less than* $3.85.

Why do we make this offer? Because we know that when you learn the true value of the Jacobs Improved Drill Chuck, you will be our satisfied customer. A satisfied customer is of more value to us than a Drill Chuck. Therefore, we will make a profitable investment and SO WILL YOU.

Our new illustrated catalogue sent free upon request.

The
Jacobs Manufacturing Co.
Hartford, Conn.

That's the Stuff.





LAFFITTE WELDING PLATES

will save you more on a single, difficult job than they will cost you for a year.

If you use them—encourage their use—if you don't—get busy—you are losing an opportunity.

LAFFITTE
Welding Plates

ARE USED BY

Governments
Railroads
Manufacturers &
Blacksmiths

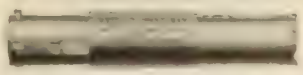
ALL OVER THE WORLD

SAMPLES FREE
On Request.

The Phillips-Laffitte Co.
Penn Building - PHILADELPHIA, Pa.

Sold by all active dealers.

Type B.—Turret 1 to 5½



CHAS. NEAT & CO., Agts.
112 Queen Victoria St.
London - England

KELLY REAMERS and BORING TOOLS

The kind you will use — — THE REASON

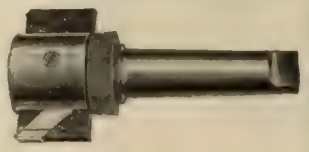
—HIGH SPEED—

ADJUSTABLE—REPLACEABLE—BLADES

We solve the "HOLE" problem—ask us.

THE KELLY REAMER CO., Cleveland, U.S.A.

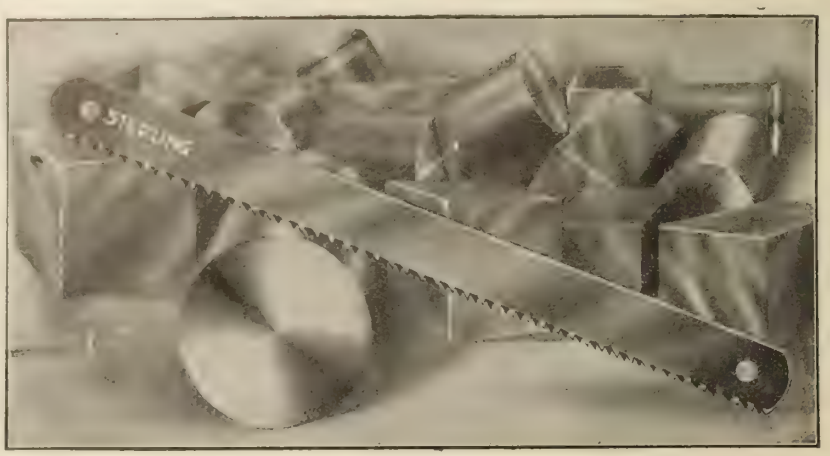
Type C.—Cylinder, 3" to 12"



"Sterling"
Hack Saw
Blades

Have no Equal.

A trial will convince you.

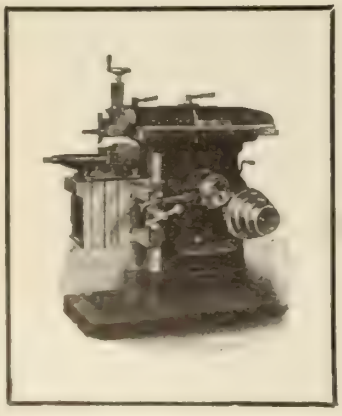


Manufactured by

DIAMOND SAW AND STAMPING WORKS,

Buffalo, N.Y.

Write for Catalog and Prices.



Steptoe Shapers are

GOOD: Because of the care taken in construction.

STRONG: Because the Column, Ram and Base are heavily ribbed and braced and the metal placed where it is needed.

DURABLE: Because all wearing surfaces are hand scraped to standard surface plates and provided with gibs to take up any wear.

The John Steptoe Shaper Co.

1953 Jessamine Street - - - - CINCINNATI, OHIO

Agents: GENERAL SUPPLY CO. OF CANADA, Limited, Ottawa, Toronto and Winnipeg



High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

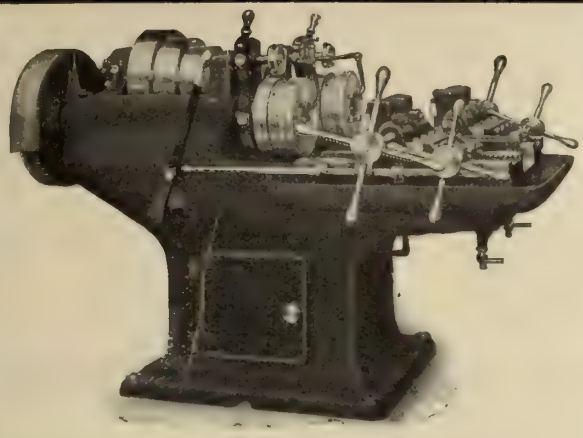
100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.

2305 Farmers Bank Building, PITTSBURG, PA.

EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO
Manufactured under Davy Bros., Ltd., Patents.

The advertiser would like to this paper in writing to advertisers.



Protected by Patents.

Heap's High Speed Screwing Machines

fully meet the demand for accurate and durable machines, unsurpassed in quality and containing the latest and best features for convenient operation, and large and accurate output. The perfecting of these machines did not happen at once; it took time and careful experimental preparation. Each of the new features embodied in these Screwing Machines has been under severe service and rigid test for a considerable period.

SEND FOR FULL PARTICULARS

Joshua Heap & Co., Ltd.,

ASHTON-UNDER-LYNE, ENGLAND

Canadian Agents: PEACOCK BROS., Montreal

BLISS

Pieced Tinware Machinery

BLISS



Bliss machinery covers every requirement for the economical manufacture of pieced tinware in all its varieties; no matter what the requirement, there is a Bliss machine for it. The No. 30 Press illustrated covers a wide range of work in this particular field.

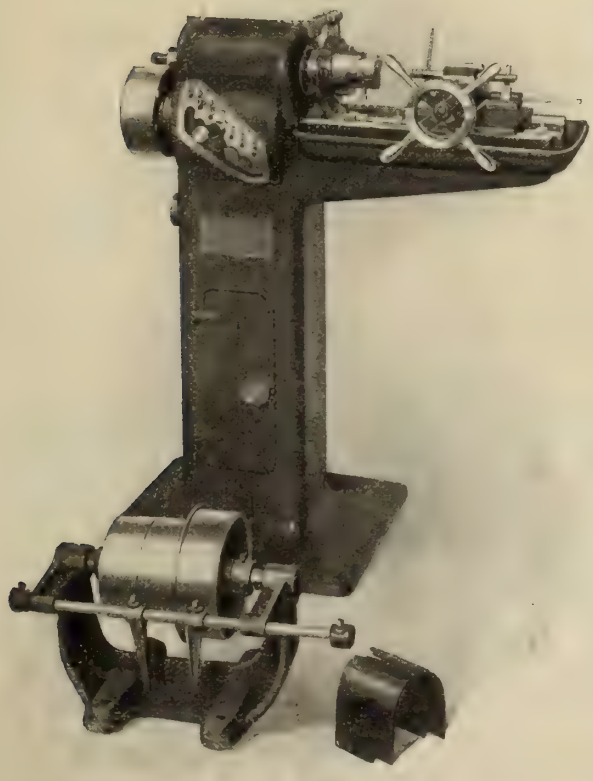
Send samples, state requirements, see what we can do for you

On Request, Pieced Tinware Machinery Catalog, 10G.

E. W. BLISS COMPANY

20 Adams St. - - BROOKLYN, N.Y.

London Office---114 Queen Victoria St., London, E. C., England.



The Geometric Threading Machine

equipped with one of our STANDARD DIE HEADS, is turning out a large amount of accurate work—work that cannot be done on the usual Screw Machine, and work that cannot be economically done in any other way.

The Die Head with which this Machine is regularly fitted has a range of cutting from ¼ inch to ¾ inch, the sizes obtainable being, ¼ inch, 5-16 inch, ⅜ inch, 7-16 inch, ½ inch, ⅝ inch and ¾ inch.

Where fine pitch threads are to be cut on larger diameters, the Machine can be fitted with a Die Head to take care of the work.

The chasers, from time to time, can be renewed at slight cost as they become worn.

Do not confuse our Machine with the usual run of Bolt Threading Machines.

SEND FOR DESCRIPTIVE BOOKLET.

The Geometric Tool Co.

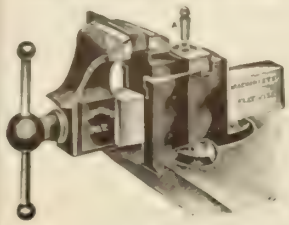
NEW HAVEN, CONN.

Canadian Agents: Williams & Wilson, Montreal; A. R. Williams Machinery Co., Toronto



HINTS TO BUYERS

Do Not Be Misled by Inferior Imitations.



There is but one

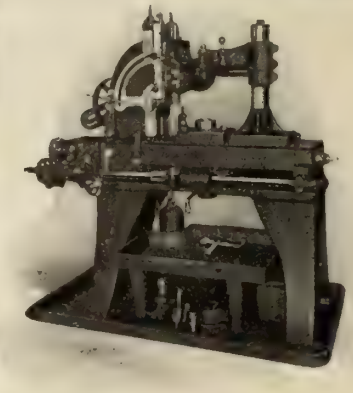
PRENTISS VISE

Made by

Prentiss Vise Company

Hardware Building, 106-110 Lafayette St., Cor. Walker St., NEW YORK

Canadian Agents: A. McFarland & Co., Coristine Bldg., Montreal



The Whiton

AUTOMATIC

Gear Cutting Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.



ROCKWELL

CASE HARDENING

FURNACES

For Gears, Pinions, Car Wheels, Axles, Cranks, Tools, etc.

Complete case-hardening equipment installed and operated.

Write for catalog No. 26

W. S. Rockwell Company

50 Church St. :: :: NEW YORK

(Hudson Terminal Bldg.)

(The Original Furnace Rockwell)

NORTON JACKS

Standard on the Leading Railroads

Made in Canada.

Stock carried for **immediate shipment.**







Manufactured only by

A. O. NORTON,

COATICOOK,

Prov. QUEBEC.

STOCK CARRIED BY

MUSSENS LIMITED, - Montreal and Winnipeg

H & E PATENT BALL BEARING LIFTING JACKS

for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and [illegible] of durability are unequalled.



Made in plain and foot lift styles, fully guaranteed.

Manufactured by

H & E Lifting Jack Company

WATERVILLE, QUE.

Stock carried by F. H. HOPKINS & CO. Montreal

CUT GEARS

THEORETICALLY CORRECT IN RAWHIDE OR METAL

ROBERT GARDNER & SON LTD

Nazareth St. ~ MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.

Thor

PISTON AIR DRILLS



Sold in Canada by
H. W. PETRIE, Limited
Toronto
Montreal
Vancouver

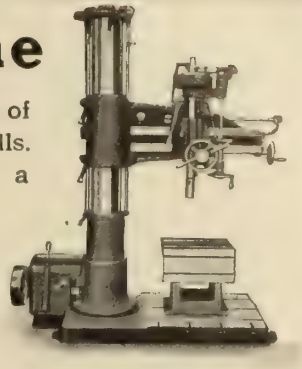
The Drill with CORLISS VALVE MOTION
30% greater efficiency guaranteed.

Independent Pneumatic Tool Company
Chicago New York Pittsburg San Francisco

Get in Line

with the satisfied users of "Mueller" Radial Drills. The first step is to get a circular.

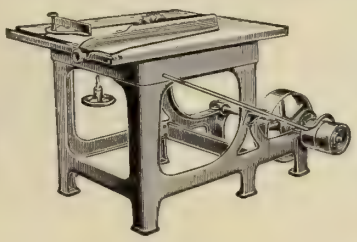
WANT ONE?



The Mueller Machine Tool Company
CINCINNATI, OHIO

Agents: The General Supply Co., of Canada, Ltd., Toronto, Winnipeg, Ottawa. Hallman, Penisten Machinery Co., Vancouver, B.C. The Foss & Hill Machinery Co., Montreal, Que.

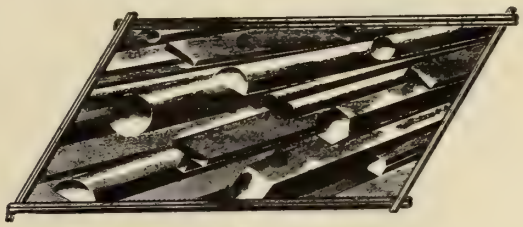
Look!



Only $50.00 for an all iron SAW BENCH with countershaft complete. It will pay you to investigate, Send for circular giving full particulars. Daniels Planers, 24 to 48-in. any length.

R. E. KIDDER, 27 Hermon St., Worcester, Mass.

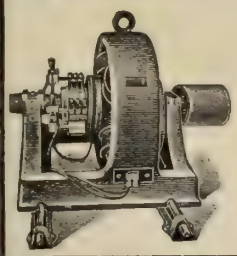
Union Drawn Steel Co., Ltd.
Hamilton, - Ontario



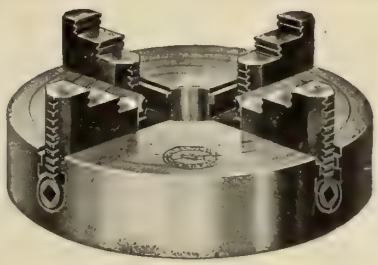
Manufacturers of
Bright Finished Steel Shafting and Shapes
Large Stock of all Sizes. Send for Price List,

YOU NEED MORE LIGHT
IN YOUR FACTORY. WRITE

TORONTO & HAMILTON ELECTRIC CO.



MANUFACTURERS OF
Dynamos
for Light and Power
AND ALL
ELECTRICAL APPARATUS



Union No. 19

Union Light Pattern Independent Chuck

Designed for light, accurate work, in small sizes, has socket screws and hardened steel thrust bearings.

This is only one of the many styles shown in our complete catalogue. **Send for a copy.**

Union Manufacturing Co.
26 Cortlandt Street, New York NEW BRITAIN, Conn., U.S.A.
MAKERS OF A COMPLETE LINE OF CHUCKS.

TELEGRAPHIC ADDRESS "HALLTYNE" WORKS PHONE MAIN 256

THE HALL ENGINEERING WORKS
14 TO 16 JURORS STREET, MONTREAL

ENGINEERS, BOILERMAKERS, BRASS & IRON FOUNDERS, COPPER SMITHS & BLACKSMITHS, SHIP REPAIRS A SPECIALTY

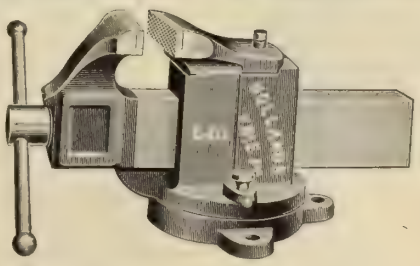
Agents for J. & E. Hall's Refrigerating Machinery.
Atlas Preservative Co. & United Asbestos Co.
W. H. Allen, Son & Co., Ltd.
ENGLAND

THOMAS HALL Phone West 1737
Late Supt. Engineer Messrs. Elder Dempster & Co. & Can. Pac. Rly. Co., London

HOLLANDS VISES

have been used exclusively for a quarter of a century by many leading industrial and railway shops in Canada and U.S.A

Each style is adapted perfectly to its particular work.



Filers' Vise with Swivel Base and Jaw.

Catalog Sent on Request.

Hollands Mfg. Co. - - Erie, Pa.

Don't fail to mention "Canadian Machinery" in writing to advertisers.

PNEUMATIC TOOLS



The absolute safety and simplicity of transmitting compressed air, its wide range of profitable uses and the economies effected by its uses, give it an indisputable position of supremacy as a means of transmitting power for operating small portable tools.

Pneumatic tools are not delicate, complicated pieces of machinery, but positively simple, rugged little money savers, made to stand rough usage, yet maintain their efficiency.

In "Imperial" designs wearing parts are reduced to the reasonable limit of simplicity, and manufactured to give the greatest satisfaction.

No part of a plant equipment, representing the same investment, will do more to reduce labor costs, increase output and enlarge dividends than a good pneumatic tool equipment. We firmly believe that "Imperial" tools represent the very best sustained value, first costs, maintenance and operating costs being considered. They are thoroughly well designed, embody all practical up-to-date improvements and give very exceptional efficiencies. These features have won for "Imperial" tools their present favored position.



CANADIAN RAND CO., LIMITED

Commercial Union Building, MONTREAL, Que.

TORONTO COBALT WINNIPEG LETHBRIDGE ROSSLAND VANCOUVER SPOKANE HALIFAX SYDNEY

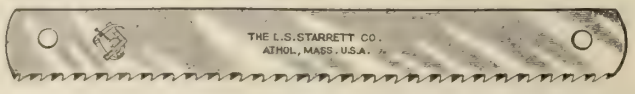
STARRETT TOOLS

ARE THE STANDARD

FOR ACCURACY, WORKMANSHIP, DESIGN AND FINISH



HACK SAWS



These blades are made of the finest grade of steel. The teeth are sharp, with square cutting points, and evenly set. They are tempered by our improved process, which leaves them hard and tough, so that they will not "shell off." They are too hard to file. The set of the teeth is just enough to insure a free, smooth and rapid cut, removing no more stock than is necessary.

LOOK FOR THIS MARK ***ON SAWS AND LABELS***

Send for free Catalogue No. 173 and Supplement, 192 pages of the best of Fine Mechanical Tools.

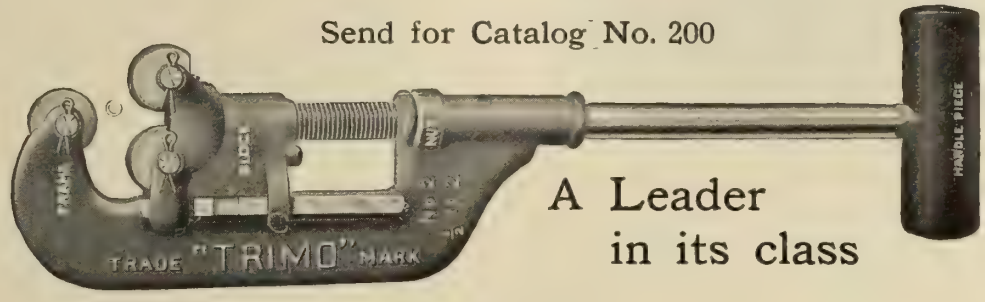
THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.

THE TRIMO PIPE CUTTER

Convertible from a 2-roll and 1-wheel into a 3-wheel cutter.

Send for Catalog No. 200



A Leader in its class

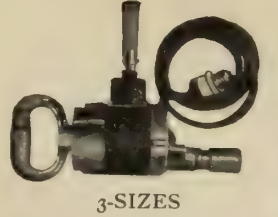
MADE BY

Trimont Manufacturing Company

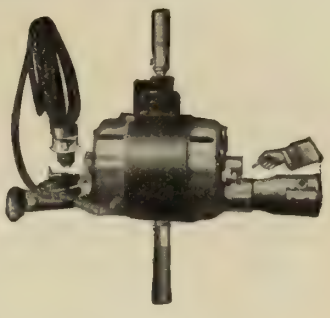
ROXBURY - - MASSACHUSETTS

U. S. Electric Drills and Grinders

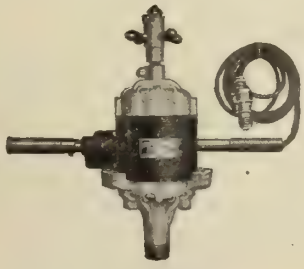
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



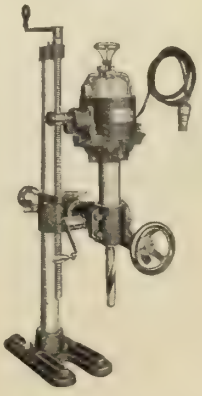
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

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HERE is a list of standard boilers which we are prepared to furnish at once from stock. These are all new. are built to standard specifications, are tested and inspected and are in the best of condition.

RETURN TUBULAR HIGH-PRESSURE BOILERS

3—40"	Diameter	x	10'	Long
4—44"	"	x	12'	"
9—48"	"	x	14'	"
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10—60"	"	x	14'	"
2—60"	"	x	16'	"
8—66"	"	x	16'	"
4—72"	"	x	16'	"
15—72"	"	x	18'	"

LOCOMOTIVE BOILERS

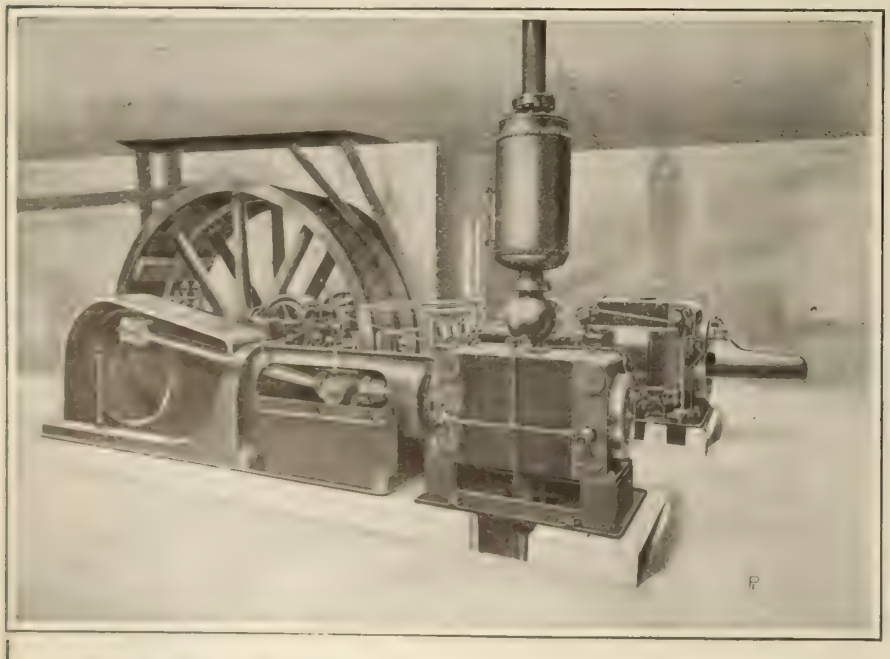
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1—40	"	"
1—50	"	"
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4—30"	Diameter	x	72"	High
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WATEROUS ENGINE WORKS CO., LIMITED, BRANTFORD, CANADA



Cross Compound Goldie Corliss at Cosmos Cotton Co., Yarmouth, N.S. Rope Drive.

Reliability is the most important consideration in the selection of a Power Plant.

Manufacturers above everything else must have a steady day in and day out service.

The only way this can be obtained is by the installation of a HIGH GRADE STEAM ENGINE.

Goldie Co liss Steam Engines give a maximum of service all of the time.

Remember your **Exhaust Steam** does away with
HEATING BILLS

Ask for our Catalog and all Particulars

The Goldie & McCulloch Co., Limited

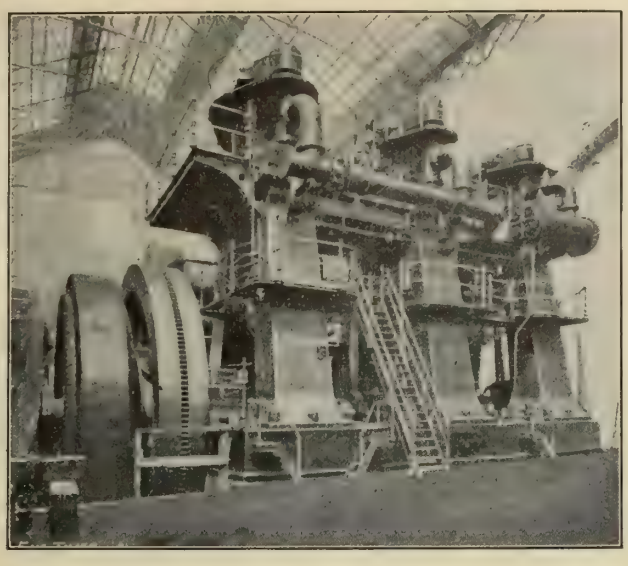
GALT, - - ONTARIO, - - CANADA.

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A BIG ENGINE





THE Engine, of which cut is shown here, was at the Glasgow Exposition and its bearings were lined with Magnolia Metal. We are informed that it was the only Engine that ran continuously during the Exposition without having to shut down because of hot boxes: whereas other large Engines at this Exposition, in the bearings of which the manufacturers used metals of their own make, had continual trouble. John Musgrave and Sons are among the greatest Engine builders of the world.

Globe Ironworks, Bolton, Lancashire.

Messrs. The Magnolia Metal Company, Limited.

Gentlemen,—In reply to your enquiry, we beg to inform you that we have used a very large amount of Magnolia for our bearings, and have found the same to give excellent results. We have fitted all our Electrical Engine bearings with this class of metal, including the Glasgow Engines of 5,000 I.H.P., the largest of which is 32 ins. diameter, 64 ins. long, and we have every confidence in recommending it for its splendid wearing and anti-friction qualities.

Yours truly,
(Signed) JOHN MUSGRAVE & SONS, Limited,
Walter M. Musgrave, Director.

TRADE MARK

Special Offer

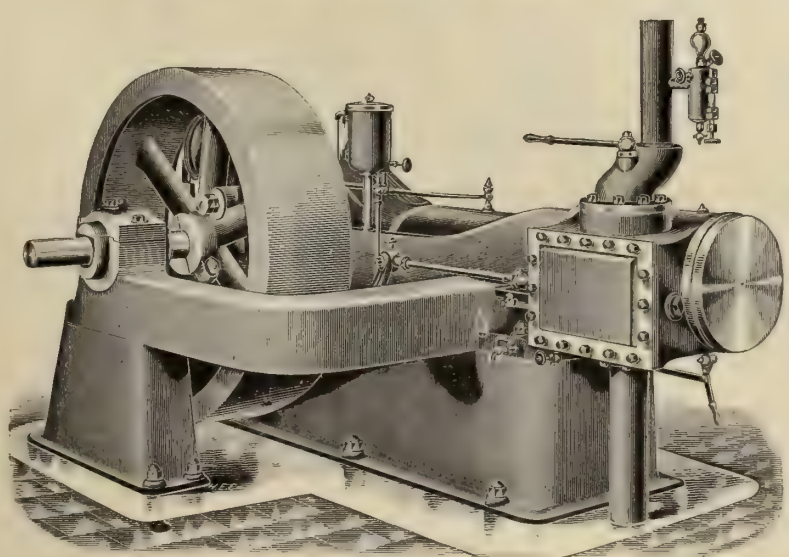
PRACTICAL ENGINEER POCKET BOOK, 680 pages, over 2,000 subjects. We do not aim to make a profit on this book, as it is an advertisement, therefore offer it at the very low price of 40c., postpaid. Many Engineers pronounce it invaluable. Address Montreal office.

Sold by Leading Dealers Everywhere or by

Magnolia Metal Co.

225 St. Ambroise Street : MONTREAL
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BEARINGS IN LINE



In sizes up to 125 horse-power, the outboard bearing of our side-crank engines is connected to the frame by a wing, keeping the bearings perfectly in line.

These engines are built on the interchangeable system, and duplicate parts are kept in stock, ready for shipment on receipt of order.

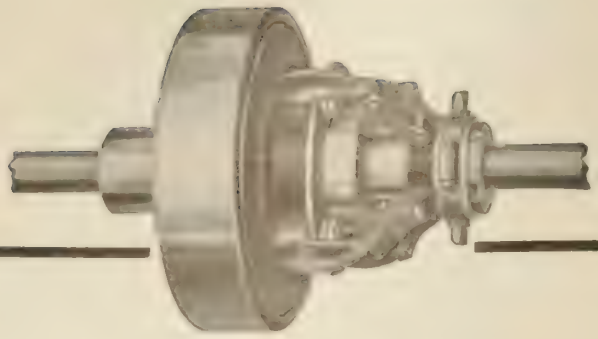
They have our latest improved governor and oiling system and are strictly high class in every respect.

Robb Engineering Co. LIMITED

AMHERST, N.S.

DISTRICT OFFICES

Canadian Express Building, Montreal	R. W. Robb,	Manager
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Union Bank Building, Winnipeg -	W. F. Porter,	"
Grain Exchange Building, Calgary -	J. F. Porter,	"



"Simply Positive and Positi ely Simple"

Here's Why

When we tell you that you can save more power, you will have less trouble, you have a surer transmission using **Positive** Combined Friction and Jaw Clutches, than with any other type, we don't simply say, "There's a reason." We say, "Here's Why." And here is why.

You know that by being able to shut off at once machinery where idle, you save power. But, had you thought about the item of saving power when running---your biggest item. The **Positive** Clutch is a jaw clutch when running, yet it will couple a driving shaft at any speed into a driven shaft at rest against full load. You throw in the lever part way, and the frictions grip instantly until the driven shaft attains the speed of the driver; then the jaws engage and transmit the power, the frictions releasing. There is no wear, no slipping, no loss of power.

Positive Clutches always transmit all the power; they make good where others fail they cure transmission troubles. It's likely we've cured a case similar to yours. Aren't they worth investigating?

The Positive Clutch & Pulley Works, Limited

11-13 Jarvis Street - - TORONTO, ONT.

THE
LANCASHIRE DYNAMO AND MOTOR CO., Ltd.

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Motors and Generators —for— all purposes

"Oneida Economy"



Oneida Steel Pulleys are a quarter to a third the weight of cast iron and therefore save from two-thirds to three-quarters of the power required to revolve a cast iron pulley.

The oval crown face fits the belt perfectly, offering 20% better belt adhesion than any other pulley on the market.

Do You need Economy?
Get the Oneida.
It is the best.

SEND FOR OUR CATALOGUE

Oneida Steel Pulley Co.

Oneida, N.Y.

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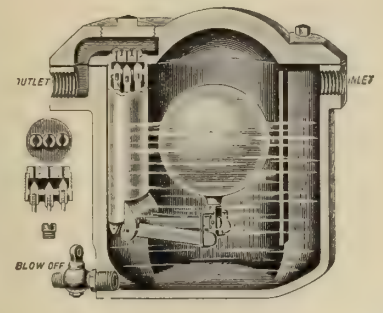
THE Wright "Emergency" Steam-Trap

Drains Automatically and Continually the Accumulating Condensation from Steam Systems.

The fact insures DRY STEAM with its well known Efficiency and Economy.

Three Valves Insure Great Capacity

Try One 30 days at our risk.



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127 Prince Street, - Montreal, P.Q.

Winnipeg, Man. St. John, N.B. Toronto, Ont.



"That Drive Needs a New Process Noiseless Pinion"

"The motors and tools in my shop run faster than yours, the motors carry heavier loads, I've got five drives to your one, all of them geared, too, but you can hear the telephone ring when you're clear across the building. I don't bother with the gears like you do, yet the teeth don't show any bad wear like that, and I haven't replaced a gear in two years.

"You can make your shop just as quiet by following my example and replacing those steel pinions with New Process Noiseless Pinions."

You will find many shop foremen that talk like this, for besides being a positive benefit to the machine. New Process Pinions are a boon to tired nerves, and do away with many a misunderstanding

The NEW PROCESS RAW HIDE CO.
OFFICE & WORKS N.P.R.H. SYRACUSE, N.Y.

WHICH IS BEST

BELTS THAT ARE LONG-LIVED AND SERVICEABLE UNDER THE SEVEREST TEST, OR BELTS THAT ARE INEFFICIENT AND UNDEPENDABLE?

Goodhue Belts

Goodhue Belts stretch less, wear longer and give better service than ordinary belts. The GOODHUE ACME is absolutely waterproof.

PUT IT TO THE TEST

Take two similar machines, put a Goodhue Belt on one and any belt you may desire on the other; use them an equal length of time, then note their condition. The Goodhue will show less wear, and you will have saved much time lost in tightening the other sort.

Write us for particulars.

J. L. Goodhue & Company, Ltd., Danville, Que., Can.

ANNOUNCEMENT

The new factory of

The Hamilton Gear & Machine Co.

with modern equipment for accurate cutting of spur and bevel gears will be in operation on or about

JULY, 1911

This will be the only firm in Canada specializing in

GEAR CUTTING

Factory: Cor. Concord and Van Horne Aves.

TORONTO - ONTARIO

THE TOOL FOLLOWS THE WORK



if you have Gem Flexible Shafting --- and the work will be done rapidly and well, because Gem shafting runs easily and smoothly, is strong and "rigid." It's the easiest to repair of any on the market.

"GEM"

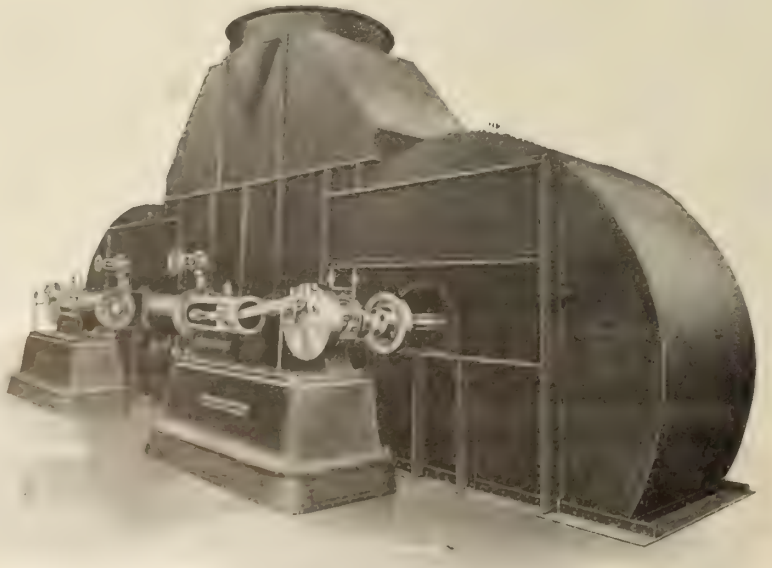


on an Oiler means long, satisfactory service. These famous oilers are made for all purposes and all carry the iron-clad Gem guarantee.

ASK FOR CATALOG.

Gem Manufacturing Co.
3257 SPRUCE ST.
Pittsburg, Pa., U.S.A.

English Agents—A. A. Jones, Follard & Shipman Co., Limited, Church Gate, Leicester, England.



Burn Cheap Fuel

With the Sheldon Mechanical Induced Draft System you can cut the cost of fuel in half, by utilizing a cheaper grade, or can secure better and almost smokeless combustion from the same grade of fuel that you are now using.

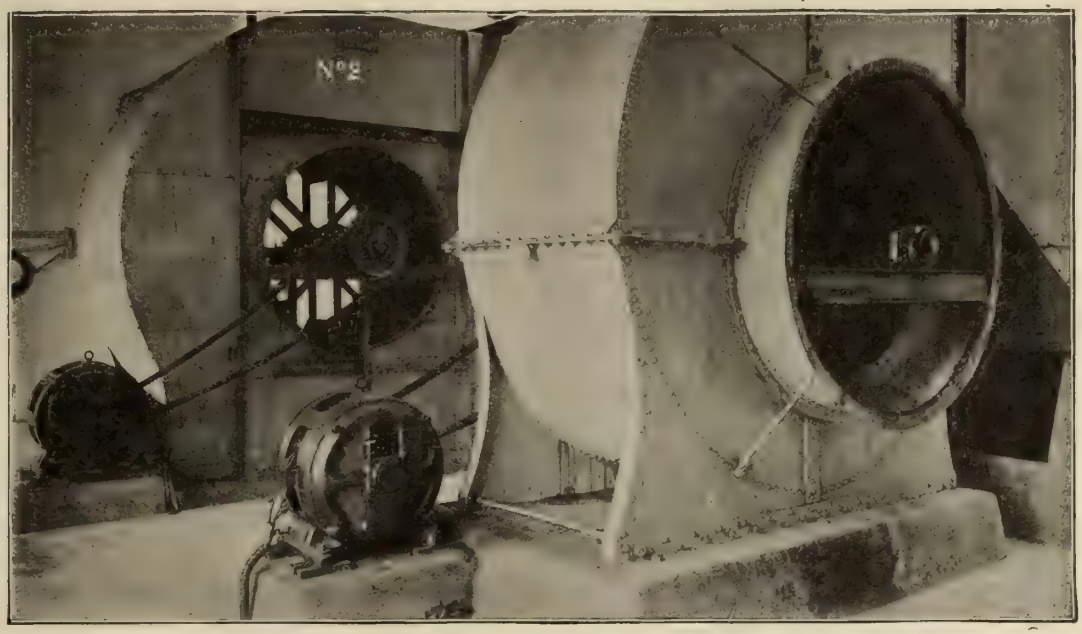
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RENOLD PATENT SILENT CHAINS

QUIET DURABLE COMPACT



(A Common Application of Renold Silent Chains.)

Two 25 H.P. Motors driving Fans which force air through a nest of steam pipes for warming and ventilating. Write for Catalogue and particulars of Drives we have running in your neighborhood.

JONES & GLASSCO, SOLE CANADIAN AGENTS MONTREAL

STEEL CASTINGS

By the TROPENAS CONVERTER PROCESS

We beg to announce that owing to the growth of our steel foundry business we are giving up the manufacture of grey iron castings, and in future by specializing hope to give still better satisfaction.

When new improvements at present under way are finished, we will have the most modern and best equipped steel foundry in Canada for the manufacture of steel castings up to 1,000 lbs. weight.

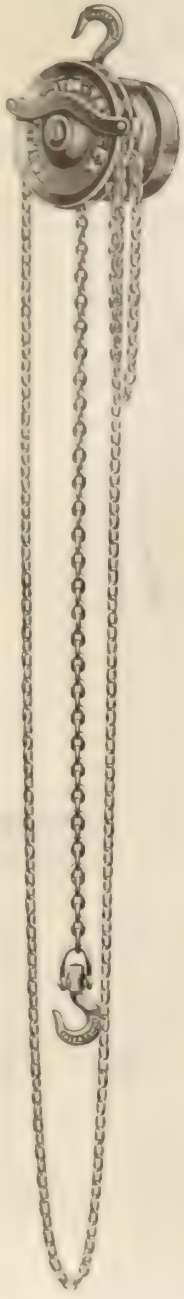
Pattern Work

Parker Foundry Company, Limited

27 Tanstey St., - - - - MONTREAL

Don't fail to mention "Canadian Machinery" in writing to advertisers.

THE TRIPLEX BLOCK



Quality! Quality! Quality!

ELEVATORS are insured—inspected. Their safety is constantly watched and guarded.

Chain blocks are seldom insured—seldom inspected. Their safety depends on the maker.

He must put the right materials and workmanship into every part. They must be always ready for every burden—every strain—every shock.

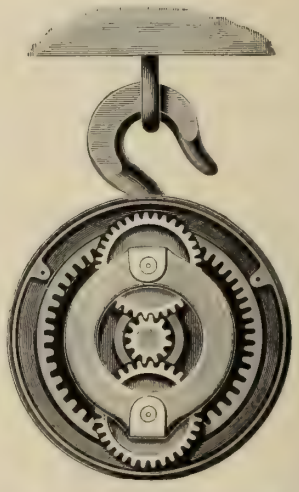
A broken chain block means damages—perhaps to life—surely to property.

Guarantees don't count---you must have quality.

Triplex Blocks have the Yale Quality---the best materials that money can buy---the skilled workmanship of picked men.

TRIPLEX BLOCKS { **16 Sizes:** One quarter of ton to forty tons. **300 Active Stocks** all over the United States.

Send for Book of Hoists to-day---Yours for a postcard.



The simplest, strongest, most efficient, most durable hoisting device in the world.

Largest Railway and Mill Supply House in Canada

SUPPLY DEPT.

Pratt & Whitney Small Tools
Reamers, Milling Cutters, Drills, Taps, etc.
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Files and Rasps, Twist Drills, Mining Steels
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High Speed Drills, Hill Lathe Tools
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Lathe and Drill Chucks
Buffalo Forges and Blowers

The Canadian Fairbanks Co.

Limited

MONTREAL WINNIPEG TORONTO VANCOUVER
ST. JOHN, N.B. CALGARY SASKATOON
OTTAWA

The advertiser would like to know where you saw his advertisement—tell him.

Interesting Data on Manufacturing Machine Tools*

By Luther D. Burlingame **

The Brown & Sharpe Co., Providence, R.I., Have Prepared Some Important Data of Interest to Men in Charge of Machine Tools. In the Accompanying Article the Author has Given Details of Feeds and Speeds Used in Milling, the Rate of Production, the Amount of Material Removed and the Power Required.

THE extensive set of special tools required to make a modern machine tool on a manufacturing basis and to attain the degree of accuracy required is indicated by the tool equipment for making the spiral-head swivel for a universal milling machine. The tools required for making it are listed below:

(a) Boring fixture and tools in cupboard.
(b) Counterbalance for grinding.
(c) Driver for turning.
(d) Counterbore for spindle rear-washer seat.
(e) Jig for drilling front-bushing screw holes.
(f) Reamer for index stop-pin hole.
(g) Taper reamer and test plug.
(h) Roughing and finishing taper reamer.
(i) Arbor for turning.
(j) Jig for drilling worm-shaft bushing stop screw hole.
(k) Jig for drilling oil and screw holes.

*Presented at joint meeting of American Society of Mechanical Engineers and Institution of Mechanical Engineers.

** Chief draftsman, Brown & Sharpe Manufacturing Company.

(l) Jig for finishing drilling-spindle stop pin hole.
(m) Milling cutter.
(n) Fixture for graduating.
(o) Fixture testing graduations.
(p) Test plug.
(q) Bushing for testing rear bearing.
(r) Device for testing.

Boring Fixture.

Among these tools the fixture for boring has been selected as typical of the extent of the equipment necessary for the production of such parts. Figs. 1 and 2 show this fixture in the cupboard made to store it when not in use, and in front is a spiral-head swivel for the manufacture of which the fixture was designed. The boring bars and cutting tools have their proper place in the top section of the cupboard, being so grouped that the tools for use in each position are together. The fixture itself is placed on a carriage in the lower part, this carriage being mounted on wheels which are guided on a track. When the front door is opened a section of track attached to it and matching the track in the cupboard provides that the carriage can be drawn out to a position where it can be readily lifted onto the boring mill. A hook on the end of each rail prevents the carriage from being run off onto the floor.

This boring fixture is of special interest in that it can be set to bore the swivel in three positions without removing it from the fixture. As set in Fig. 1 it is in position to bore holes A. After these are bored the swinging plate B is unclamped and the upper part of the fixture turned end for end so that other holes on the opposite side to the holes A can be bored. The swinging plate B is then turned at right angles to its former position and the upper part swung on trunnions provided so that lugs C can be clamped by bolts D upon the seat E, as shown in Fig. 2. This brings the fixture in position to face at F, and bore the hole for the spindle bearing, etc. The cover J, hinged to allow placing the work in the fixture, is clamped by a strap K which can be loosened and turned half way around to disengage it from the cover without removing the bolt. The lug

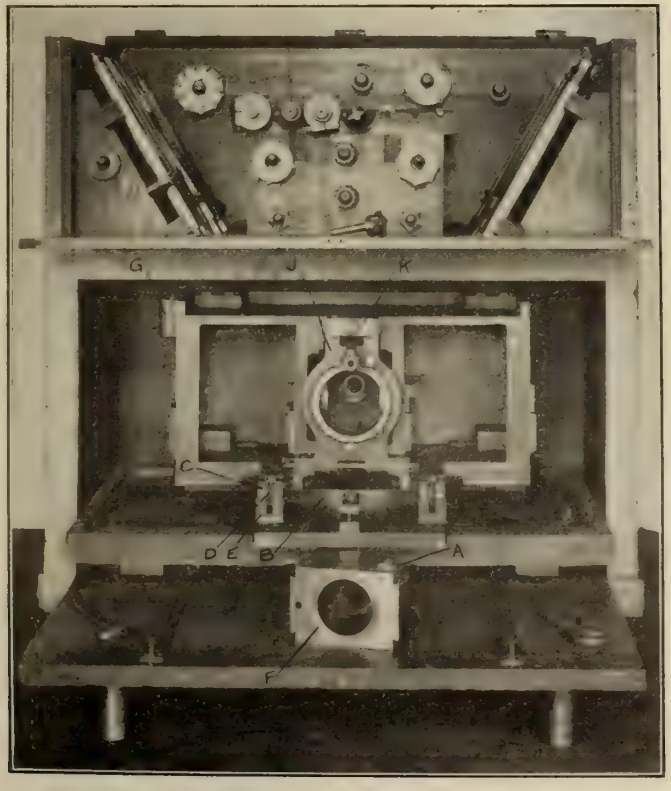


Fig. 1—Boring Fixture for Spiral Head Swivel.

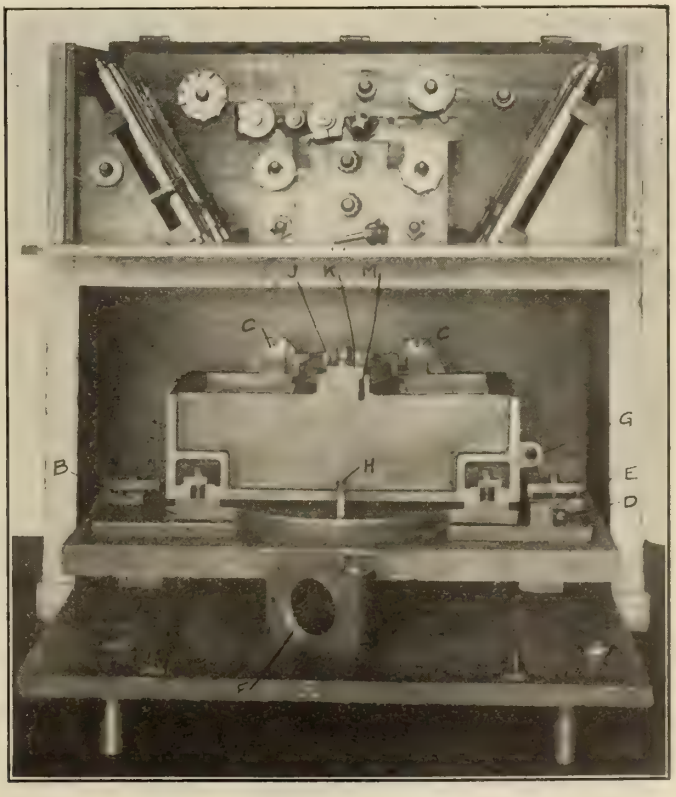


Fig. 2.—Boring Fixture for Spiral Head Swivel.

G is for the insertion of a bar to aid the workman in swiveling the fixture so that one man can operate it. The plug H fitting in a taper hole for each position insures the setting of the fixture so that all holes will be in perfect alignment. The slot M is for the insertion of a taper wedge which, coming against the face of the swivel locates as in the time of milling. In Fig. 4 is a data sheet for this operation, made out on a printed form such as is used by the Brown & Sharpe Mfg. Co. for such tests and the data given are for regular production under manufacturing conditions. It will be noticed that while the large cutters are of high-speed steel, the small cutters running at much lower surface speed are of ordinary carbon steel.

fixture is so made that the workman can easily replace the work so as to keep the machine going continuously. The cut on each piece is about 8 inches long, 4¼ inches wide at the widest part and about 1-16 inch deep.

Fig. 6 shows the style of inserted-tooth cutter used, this cutter, being of a design which avoids undue projection beyond the end of the spindle, allows the cutter to be easily removed, and also makes it possible to use the same cutter on machines with different sizes of spindles.

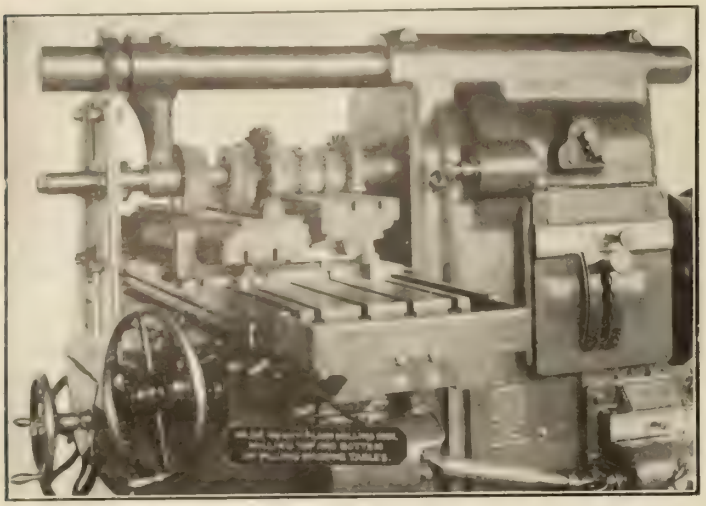


Fig. 3.—Milling Top and Bottom of Miller Tables

Milling done on No. 5 B. Heavy Plain Milling Mach. Lot 25....
Operation Milling Top and Bottom of 50 No. 1 Univ. Mill. Mach. Tables.
Photograph Negative C.-1045. Date June 3, 1907. Brown & Sharpe Mfg. Co., Providence R.I. U.S.A.

Cutter						Feed		Size of Cut			Material
R.P.M.	Surface Speed	Diam.	Style		Matl.	Per. Rev.	Per. Min.	Width	Depth	Amount in Cubic Inches	
	65′	1- 9½″	Side		High Speed						
	80′	1- 11½″	Side		High Speed						
26	55′	2- 7¼″	Side		High Speed	.078″	2.0625″	25.75″	.1875″	9.958	Hard Cast Iron
	48′	2- 7¼″	Plain		High Speed						
	32′	3- 4¾″	Plain		Carbon						
	47′	2- 6 22/32″	Slott		High Speed						

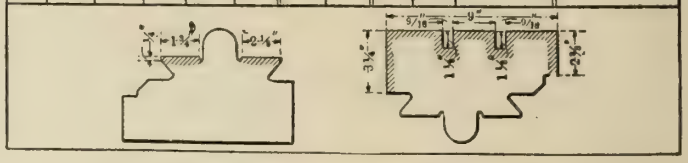


Fig. 4.—Data Card for Milling Operation in

it in proper position before it is clamped in place. When not in use the cupboard is completely closed and locked.

Milling Top and Bottom of Milling Machine Tables.

Fig. 3 is an example of milling in which the top of one table and the bottom of another table of a universal milling machine are milled at one traverse of the machine, the milling being done on a Brown & Sharpe, No. 5-B heavy plain milling machine. At the completion of the cut one table is removed and the other one, which has been milled on the top only, is turned over so that the bottom may be milled [illegible] a rough casting is put in its place and the cut repeated. This illustrates economy in handling the work as well

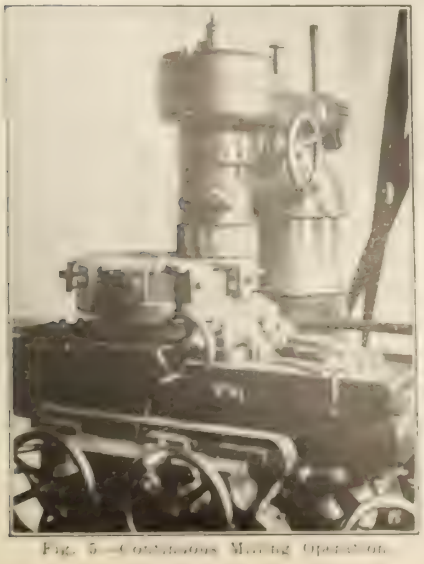


Fig. 5.—Continuous Milling Operation.

Example of Heavy Milling.

An example of heavy milling on a machine of the same size and type as used for the milling-machine tables is to be had in tests made on a steel block of 65,000 pounds tensile strength. Eighteen cubic inches of metal were removed per minute. The output of the motor was 21.05 horsepower, making 0.85 cubic inch removed per net horsepower. At no time during the test did the machine show signs of distress or appear to labor excessively, and the notable absence of vibration was emphasized in the following manner. A coin was placed upon its edge at one end of the table with its sides at right angles to the axis of the table, and on the opposite end a full glass of water was placed. The machine was then started and many cuts taken without overturning the coin or spilling any of the water.

A feature of note in connection with this test was the efficiency of the high-speed steel cutters employed. One gang removed 1,800 cubic inches of steel without having to be removed from the arbor for sharpening.

Continuous Milling Operation.

Fig. 5 gives an example of continuous milling on a Brown & Sharpe No. 5 vertical-spindle milling machine. In this case ten flat-iron bottoms were held in a special fixture on the circular milling attachment. The table makes one complete revolution in 4 minutes, thus finishing the surface of ten flat irons in 4 minutes, or 150 per hour. The

THE LANCASHIRE DYNAMO AND MOTOR CO.

The Lancashire Dynamo & Motor Co. have received the order for the complete motor equipment of the Wayagamack Pulp and Paper Co.'s mill at Three Rivers, P.Q., consisting of 44 motors of various sizes up to 400 h.p., together with the starting equipment for same. The motors will be for the most part of the squirrel cage induction type. The starting apparatus in a large number of cases will consist of totally enclosed auto transformer starters, with "in voltage and overload" releases, while in others, "star delta" totally enclosed starters will be provided. Eckstein, Heap & Co., Manchester, England, through their agents Chapman & Walker, Toronto, will supply the switch gear and main switchboard.

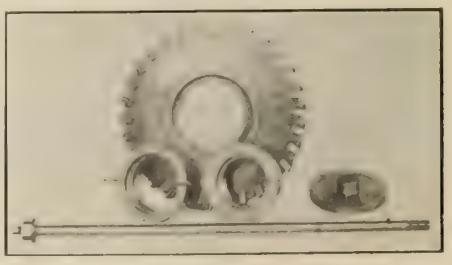


Fig. 6.—B. & S. Inserted Tooth Milling Cutter.

Sherardizing; a Modern Rust-Proofing Process

By Fred H. Moody, B.A.Sc.

The Hot Dipping and Electro-Galvanizing Processes of Galvanizing are More or Less Familiar to All; But the World Moves Apace, and Newer and Better Methods of Rust Proofing are Being Invented, Important Among These Being Sherardizing, Which is a System of Dry Galvanizing. By it, Machine Cut Threads, for Example, can be Protected, Leaving the Surface as Perfect as Before Tratment. Such a Process is Worth Investigating, and With That Object in View, This Article Gives a Description of What it is, How it is Done, its Theory, and Examples of its Varied Uses.

From the earliest times when iron and steel came into extensive use, the trouble of rusting, that is the oxidizing of the surface, has always been one of the principal troubles to contend with. Engineers at all times have attempted to produce non-rusting surfaces, and the results of these attempts have been the production of many more or less effective protective means. Like many another great discovery sherardizing was purely accidental, as shall be explained later.

Of the many effective coatings employed to stop corrosion, zinc has proved to be one of the best, being itself but slightly amenable to ordinary climatic conditions. Zinc coatings as generally employed are in the form of the usual galvanized surface, that is a thin film or envelope of the metal, covering the surface to be protected in a more or less perfect manner; the protectant, zinc, however, merely forms a coating, or separate jacket, in no sense an integral part of the article itself. This does not apply to the sherardized surface.

Previous to this method of zinc coating iron and steel to be discussed, there were only two means of so doing, the hot dipping and the electric process of galvanizing.

In the hot process, the articles to be galvanized are dipped into molten zinc which melts at a temperature of 786 deg. F., but the temperature in the pot must be kept much higher than this to counteract the cooling effect of the newly immersed articles. This necessitates a temperature in many cases 100 degrees higher than the melting point. This heats the articles to be coated, unduly, so that when immersed in cold water, which is necessitated by the fact that otherwise the surface zinc would oxidize, the articles have a tendency to warp, especially in work that is irregular in form. The deterioration resulting in the iron after this process can be traced directly to this cause; the metal is made coarse and brittle.

The result of capillary attraction of the molten metal, tends to fill up small crevices, and, in the case of bolts and nuts, destroys the form of thread. Recutting and retapping would remove these defects, but, at the same time, would not remove the zinc surface uniformly, and leaving a surface partly unprotected by zinc. Thus the object of galvanizing would be undone as the surface would be left unprotected in spots, these spots gradually spreading, through corrosion. Attempts have been made by some to first dip the bolt stock, and then roll the threads afterwards, but this has the defect of breaking the protecting surface during the rolling process.

The principal difficulty with electro-galvanizing is the inability to coat irregular surfaces uniformly, as the amount deposited at a point varies inversely as

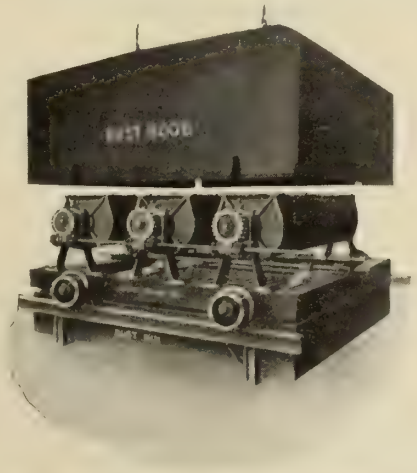


Fig. 1.—Sherardizing Machine Showing Dust Hood.

the distance between the anode and cathode. This objection does not occur in objects that can be arranged at a uniform distance so that the coating may be evenly spread. The electro-galvanizing differs from the hot process in that no deterioration of the metal occurs; but, from the non-uniformity of coating and the expense of operating such a plant, the process is not in very general use. The resulting surface is also soft and spongy.

As before mentioned, with both these processes, the coating is purely superficial, being glued on, so to speak, and not forming an integral part with the work to be protected. If for any reason the surface is not carefully cleansed from scale, grease, acid, etc., the protecting zinc will form a blister over the foreign substance, in the hot dip case, and will deposit nothing in the electric process, so that this foreign substance leaves an opening for attacking substances to corrode the article.

If two sheets of copper and zinc be placed in intimate contact for several weeks, it will be found, upon removal that both surfaces will have a covering film of brass, from the union of the copper with the zinc plate in one case, and the zinc with the copper plate in the other. This goes to prove that heat is not always an essential for the formation of an alloy, and this contention has been proved by the investigation of different eminent scientists. The same investigators have proved that alloying at low temperature tends to prevent entectics, when particles of one metal are merely suspended in the other. The failure of babbit metals may in many cases be attributed to this cause.

The discovery of the sherardizing process is due to Sherard Cowper-Coles, the noted British electro-metallurgist, who, while engaged in a series of experiments in connection with the annealing of iron discovered that metals in a fine state of division, i.e., in the form of a fine powder, when raised to a certain temperature which was several hundred degrees below the actual melting temperature of that metal, when in contact with a solid metal, volatilize, and gives off vapors, which condense on the solid metal immersed in the powdered metal. This has been applied to the coating of iron and steel with zinc by this process.

The zinc powder used is the ordinary zinc dust of commerce, not zinc oxide; and it is obtained in the process of distilling zinc from its ores. It is commonly called "blue powder," and is the dust which sublimates in the flues of the smelter, and amounts to from five to ten per cent. of the yield of spelter. In this powder are beads of pure zinc and traces of cadmium, lead, and iron, but a small amount of free oxide, besides it is mostly composed of impalpable particles of blue grey powder from 1-40,000 to 1-50,000 of an inch in diameter.

The zinc dust particles are zinc in a very unstable state, due to the sudden

cooling to which each minute particle is subjected. The chilled surface of each of these spherical particles is oxidized, which bears an important part in the theory of zinc dust action. Inside the molecules of the metal are packed without any regular order, and they are constantly striving to rearrange themselves in more comfortable order, which cannot be done without bursting the chilled shell in which they are confined,



Fig. 2.—An English Sherardizing Furnace, Showing Drum Containing 2,800 lbs. Bolts, the total weight being 6,600 lbs.

and the reaction of this catastrophe results in vaporization. Hence, at a temperature far below that at which the metal itself would be volatilized, the zinc dust is converted into a vapor of zinc with some oxide. The temperature at which this zinc dust vaporizes is around 400 deg. F., a temperature at which metallic zinc is very brittle.

Articles to be sherardized are first cleaned in any of the usual ways such as pickling or sand-blasting, the extent of the cleaning largely depending on the work to be done. In contradistinction to the hot or electric method, the surface does not of necessity need to be freed from oil, as the latter has been found to have no detrimental effect.

The articles are placed inside iron [illegible] drums along with sufficient zinc dust to completely cover them. The drums are then closed up with dust-[illegible] and gradually heated up, being meanwhile slowly revolved or oscillated, as in [illegible] order to insure good contact between the dust and the articles. It is practically impossible to break articles through too rapid heating, as the intervening dust acts as a poor conductor of the heat, taking considerable time to transmit.

After the necessary length of time in the oven to do the sherardizing, the drums are withdrawn, and allowed to cool slowly before opening, the poor conductivity of the dust acting in a manner similar to the previous instance, the articles cooling so slowly that warping and breakages are reduced to a minimum.

Experience has shown that the maximum temperature for sherardizing never exceeds 750 deg. F., so that the inherent qualities of the articles are never injured; highly tempered and fragile articles are handled at a much lower temperature, the maximum temperature of the furnace never exceeding 750 deg. F., which is 36 degrees lower than the melting point. Owing to the poor conductivity of the metallic powder, the maximum temperature in the drum where the articles are, is much less, and is said to never exceed 700 deg. F.

On opening the drum, the articles contained are found to be completely covered with an even homogeneous coating of metallic zinc. The threads of fine cut bolts and nuts are found to be as perfect as before the operation, the bolt and nut fitting perfectly, and no part is left unprotected. Steel gauze comes out perfectly coated and without a single hole having been stopped up, and any scratch on the surface before treatment, comes out clean and sharp to the vision. Still more wonderful, a close coiled spring will come out uninjured, and not only coated inside and outside of the coil, but also rust-proof between each individual spiral as well, notwithstanding the fact that the spirals had been in close and hard contact with each other during the process of sherardizing. Scales graduated to the hundredth part of an inch, come out perfectly clear and distinct.

A microscopic examination of a cross-section of a sherardized surface shows the nature of the coating. It is found to be literally rooted to the article under treatment. At the top is pure zinc, followed by zinc-iron alloy, succeeded by an iron-zinc alloy, merging into the iron of the article. All these merge into each other in such a way as to make a homogeneous substance, and not a mere surface filament, merely fastened on.

The whole question of protecting iron or steel from rusting by means of a coating of zinc, is an electrical one and is based on exactly the same principles as those found in an electric battery. The iron and zinc form the negative and positive elements of an electric couple, while the atmosphere, always more or less damp, acts as the exciting medium. So long, therefore, as the iron is more or less covered with zinc, it corrodes but little as it is saved from corrosion at the positive zinc elements' expense, which is oxidized by the damp atmosphere. In addition to this principle, though it may be considered as part of it, is the fact that the oxidized zinc is precipitated on the surface of the zinc proper, in the form of more or less insoluble salts, which mechanically polarize all further action until this deposit is removed.

The alloy in itself affords a great protection, for experiments show, that the covering may be eaten down through the zinc to the alloy, and there indefinitely retarded by the resisting powers of the alloy.

The sherardizing process proves invaluable in detecting flaws in work, for from the fact that there is no capillary attraction to fill up crevices, causing cracks, invisible before treatment, to become apparent, thus leading to the discarding of the damaged piece.

At first sight it may appear strange that the drum itself should not be coated; this is due to its higher temperature; it emphasizes the fact that condensation occurs like that of atmospheric moisture on a cold water pipe. As before pointed out, the furnace temperature, which is the temperature of the shell, is at least 50 degrees higher than in the interior.

A sherardized surface may be readily buffed, giving a similar finish to nickel plating, being bluish like silver, and of a higher reflecting power, the difference being quite apparent to the naked eye.

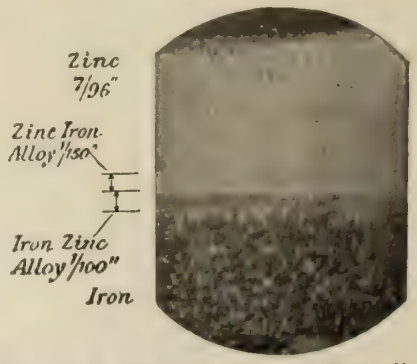


Fig. 3.—Microphotograph of Sherardized Surface Magnified, 12 Diameters.

The ready manner in which a sherardized surface will take on a finish has been employed in a new line recently, that is, in damascening, as formerly done consisted in chasing a design upon the metallic foundation of the object to be decorated, and then filling the incisions with fine wire or strips of other metal, by means of a special tool, the whole being finally smoothed and polished. Literally, the pieces were dovetailed in so as to secure permanent set. Sherardizing opens a new method of doing this, for by first taking the object to be decorated be it copper, iron, etc., and covering it with a stopping-off composition, and engraving the design in this composition, if the article be then



Fig. 4.—Copper Tray, stopped-off ready to be damascened by the Sherardizing Process.

sherardized, a covering of zinc is added to the stopped off places, which on a copper article forms a brass finish. This forms a new method of inlaying brass on copper. Vessels of all kinds can be treated this way, the cut showing an example.

The rights to grant authority to sherardize in Canada, are held by Factory Products, Ltd., Toronto, who have purchased outright the Canadian patents.

RAPID TURNING PREPARATORY TO GRINDING.

By G. E. Brownell *

IN the production of cylindrical machine parts by means of the lathe and grinding machine, too little importance is usually attached to the lathe operations preparatory to grinding.

There seems to be an instinct to accuracy, born of long experience in using the engine lathe as a finishing tool, that prompts the average lathe hand to use fine feeds and make nice clean cuts and a smooth surface on the work he is truing, regardless of whether he is making a finish cut on a piece of work to be filed and polished, or rough turning preparatory to grinding.

Rough turning preparatory to grinding means using the fastest feeds and speeds consistent with the power available in the lathe in which the work is being done. It cannot mean clean cuts and smooth surfaces because no high speed steel tool, working at its full cutting capacity, will cut smooth after a few minutes' use.

* Norton Grinding Co., Worcester, Mass.

If we examine a high speed steel tool that has been used for a half hour roughing shafts, in a powerful lathe, we find that the cutting edge is not sharp; but, on the contrary, presents a dull or slightly rounded appearance, and has small particles of the steel it has been cutting adhering to it.

A high speed steel tool in this condition has been known to stand up all day roughing .50 carbon hard, open hearth steel motor shafts, at a cutting speed of 65 ft. per minute and $\frac{1}{8}$" feed per revolution, removing from $\frac{1}{4}$" to $\frac{1}{2}$" stock from the diameter in one cut.

The number of cuts required to reduce the diameter to grinding size will depend somewhat on the lathe in use. It may mean three cuts in some cases, but if powerful lathes are used, it is possible to rough turn to grinding size in a single cut.

Cross feeds should be used except in cases where very deep cuts are taken. I recall an instance where a bar of steel $5\frac{1}{2}$" diameter was reduced to $3\frac{7}{8}$" plus 3-64" for grinding in one cut, using 1-32" feed per revolution.

It was my good fortune a few years ago to be in the employ of a large electric motor manufacturing company while they were changing their methods of manufacture from turning, filing and polishing, to turning and grinding. It had been their practice to rough turn the motor shafts to within $\frac{1}{8}$" or 3-16" of finished diameter, low priced help being used for this operation. The shafts were then taken to the engine lathe where two cuts were taken over them before filing and polishing. After installing grinding machines, this practice was not changed except that the last, or sizing cut, was taken in the grinding machine instead of the engine lathe.

After a varied experience, parts of which were pleasant and other parts not quite so pleasant, we realized that the saving accomplished by grinding the amount of stock usually left for the final, or finishing cut, in the engine lathe did not represent the total saving in cost of production that was possible, could we change our method of turning before grinding. Some of us thought that it was possible to rough turn the shafts to grinding size in a single cut.

High speed steel tools were not in general use at that time, but a few were in the shop and were considered as special tools, and could only be taken from the tool supply department by presenting a requisition from the foreman. Some of these high speed steel tools were secured and a number of shafts were rough turned experimentally. Different methods were used to prepare them for grinding: Some were turned with a coarse feed; two, and in some cases three, cuts were necessary to reduce them to grinding size, i.e., 1-32" to 3-64" over finished size; others were turned with a fine feed, and at a faster cutting speed, reducing them to within 1-64" to .020" of finished diameter, with one cut.

Careful note was made of comparison in time occupied in rough turning. A comparison of time occupied in grinding was also made. The results were so favorable that it was decided that all shafts to be ground should be turned to grinding size in the roughing lathes, using as coarse feeds as the lathes would carry.

A little more experience in rough turning showed us that the high speed steel tools would stand to take heavier cuts than the lathes would pull. Heavier and more powerful lathes were purchased and proved very satisfactory. The result was a remarkable increase in the rate of production.

STRAIN ON HOISTING ROPE DUE TO SLACK.

Experiments made by placing a dynamometer between the rope and the cage in a hoisting plant showed conclusively the bad effects of starting the load with a jerk due to a slack rope. When there was $2\frac{1}{2}$ inches of slack, the stress on the rope was 39 per cent. greater than if the load were lifted slowly and gently. With 3 inches of slack the stress was 65 per cent. greater than if lifted slowly and gently. With a slack of 6 inches, the stress was 122 per cent., or more than double, and with 12 inches slack the stress on the rope was three times as great as when starting slowly with a taut rope. Such sudden stresses on hoisting ropes necessarily cause deterioration in the strands, which eventually result in breakage, even sudden breakage of the rope. The jerk can be greatly reduced by care on the part of the hoisting engineer, and the insertion of a good spring connection between the cage and the rope.—Mines and Minerals.

LARGEST ELECTRIC MOTOR.

The largest electric motor in the world is now being made in Stafford, England. It will have a capacity of 10,000 horse-power and will weigh nearly 200 tons. A 920 volt current will supply it. The commutator will be 12 feet in diameter. The motor will be used for driving a steel rolling mill.

Geometric Chaser Grinder.—A neat 12-page booklet issued by the Geometric Tool Co., New Haven, Conn., describes this grinder, and several illustrations show it in use, and give an idea of its applicability. Short talks on the frequency with which dies should be ground, etc., are given.

The Evolution of the Centrifugal Filtration Plant Pump

By K. Campbell

The John Inglis Co., Toronto, Recently Completed a Centrifugal Pump for the Toronto Filtration Beds. The Machining of the Main Body of the Pump Presented a Problem Which Was Successfully Solved by the Superintendent. A Complete Description of the Machining and the Pump Construction is Given in This Article.

TWO centrifugal pumps were recently completed for the Toronto filtration plant by the John Inglis Co., Toronto. These were a 12 in. drainage pump and a 48 in. pump for filtration purposes. The latter is designed for 45,000 Imperial gallons and a 9 ft. head. Owing to pressure of work requiring the full capacity of their foundry, the two castings of the body weighing 14 and 8 tons respectively or a total of 22 tons, were made by the Berg Machinery Co., Toronto.



Fig. 1.—Core for one of the pump castings, Foundry of Berg Machinery Co., Toronto.

Fig. 1 shows a corner of the foundry of the Berg Machinery Co. The core for the smaller of the two castings is held suspended over the mold by a jib crane. Fig. 2 shows the large casting in the yard of the Berg Machinery Co. as it came from the mold. The casting was then cleaned for delivery, the completed casting being shown in Fig. 3.



Fig. 2.—Large Centrifugal Pump [illegible] Berg Machinery Co., Toronto, as it [illegible] mold.



Fig. 4.—The two large castings of the Centrifugal Pump in position, at the works of the John Inglis Co., Toronto.

Machining.

The machining was done in the machine shop of the John Inglis Co. The faces for the joints were planed, one

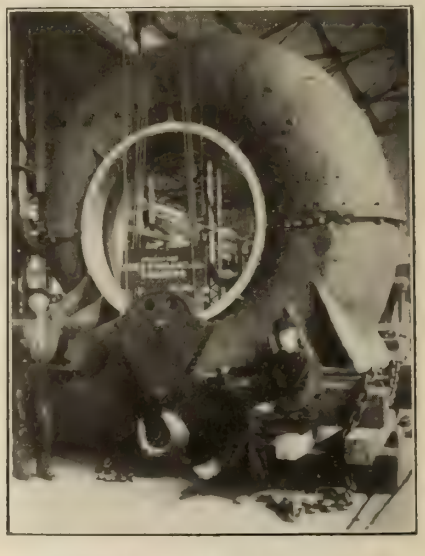


Fig. 5. Giving an idea of the size of the Centrifugal Pump.

half at a time. They were then bolted together for boring. The large boring mill has a capacity of 10 to 16 ft., while the casting was 19 ft. 6 ins. to the outside corner. The pump could not revolve and bar revolved with table. Thus, instead of the work revolving, it remained stationary, while the boring bar revolved, a casting bolted to the face plate driving the boring bar.



Fig. 3.—The finished casting in the yard of the Berg Machinery Co., Toronto, ready for delivery to the John Inglis Co., Toronto.

under the housings nor be machined in the regular way.

The pump was fastened on the outside foundation plate, one end of boring bar being attached to table of boring mill and other to cross-head of machine. This bar had a screwed feed travelling head

The bearing faces were planed at right angles to the face bored out, referred to in the previous paragraph. The outlet was machined last. Fig. 4 shows the two large castings complete after machining. The comparative size of the pump is shown in Fig. 5.

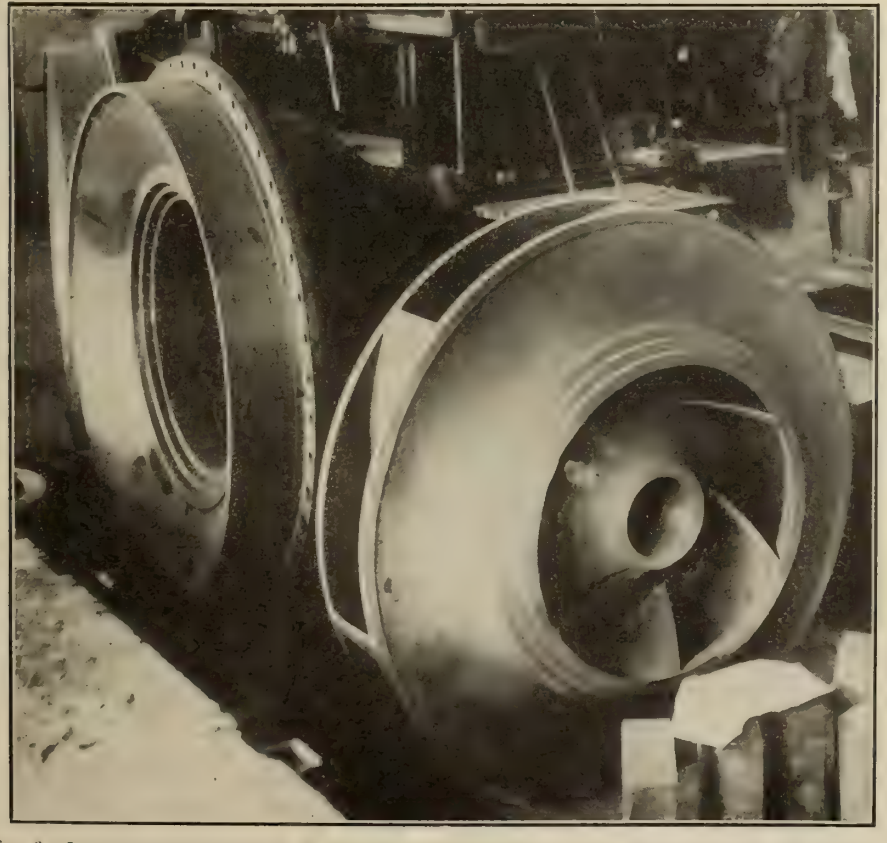


Fig. 6.—Impeller and Bearings of the Centrifugal Pump after machining, in the works of the John Inglis Co., Toronto.

The impeller and two bearings are shown in Fig. 6. The impeller is 66 ins. in diameter and weighs two tons. Each bearing was made in two parts, a complete elbow or bearing weighing three tons. The joints of the elbows were planed, and the two parts bolted together. Each elbow was then bored and faced in the boring mill.

The complete pump with all parts assembled is shown in Fig. 7. There are two intakes of 37 ins. each and an outlet of 48 ins. The pump complete occupies a floor space of 7x12 ft. and is 10 ft. high.

The pump is driven by the tandem compund condensing steam engine. The diameter of the high pressure cylinder is 13 ins., low pressure 27 ins., with a stroke of 36 ins. and r.p.m. 104. The floor space of the engine is 9x28 feet.

THE WESTERN BRIDGE AND EQUIPMENT CO.

Owing to increased business and the want of land adjacent to their present shops for extension purposes, the Western Bridge and Equipment Co., of Chatham, Ont., have started a new shop building, 82 by 225 feet on part of a 7 acre lot given by the City of Chatham. The land is located between the G.T.R. and C.P.R. The building will cost $10,500, and will have overhead traveling cranes throughout its entire

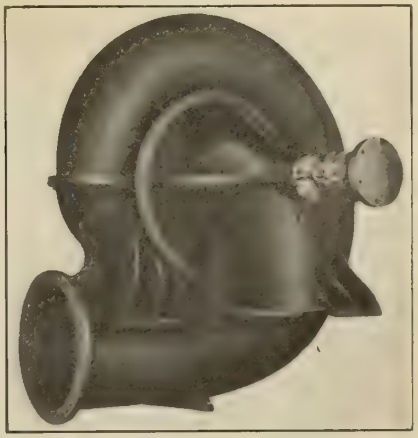


Fig 7.—Centrifugal Pump, Built by the John Inglis Co., Toronto.

length. The general equipment will be that of an up-to-date bridge and structural steel works. A charter has been applied for, under the name of the Chatham Bridge Co. Ltd., with capital of $200,000. A large part of this stock has been already placed, and purchase made of some of the tool equipment from the A. R. Williams Co., Toronto. A further tool purchase to the amount of $10,000 is projected in the near future. The provisional directors are: A. E. Drew, W. P. Drew, T. A. Drew, T. C. Martin and A. Lanigan, all of Chatham, Ont.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Engineers With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage Them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

The text and illustrations constituting the fifth article of our course form an introduction to the drawing of straight lines with curve or part circle connection at their extremities; the combination of which goes to make a detail of mechanical utility. Fig. 1 shews two steel plates ¾ inch thick, butt-jointed by means of a 4½x3½x¾ inch tee iron, single riveted to each plate by rivets 13-16 inch driven diameter. The rivets are spaced midway between the outside of tee iron web and outside of flange on same side. The rivet head diameter is 1.6 times the rivet body diameter and its thickness at centre .8 of the body diameter. The rivet holes should be slightly countersunk on the head faces as shown; this being done with writing pencil or pen freehand.

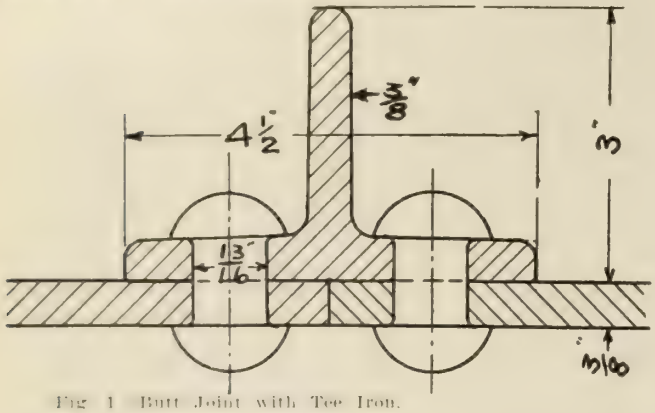


Fig. 1.—Butt Joint with Tee Iron.

In making a full size pencil drawing of this joint, begin by drawing horizontal lines representing the plate thickness, making the left hand extremities of these lines begin one inch from that edge of your paper and four inches down from the top edge of same, to the upper thickness line. Make these plate thickness lines about 6½ inches long and in the middle of this length, draw a vertical line by means of your tee and set squares to represent the butt or joint of the two plates. At this joint or butt, continue a faint vertical construction line, on each side of which, mark off the half thickness of tee iron and draw vertical lines just over 3 inches from top of plates.

As the tee iron is 3 inches deep, draw with your compass?s a s?mi-circle whose crown reaches the 3-inch mark, and whose radius is 3-16 inch. The base flanges of the tee iron have a mean thickness of ⅜ inch, and are at the outer edge 1-32 less than this. The inner edge where connection is made with the web will have a thickness 1-32 inch in excess of the mean. Each lower flange will therefore have a slight downward taper on upper face from inner to outer edge. The radii of outer and inner ends of upper face of tee iron flange is 3-16 inch, and should be drawn with the compasses.

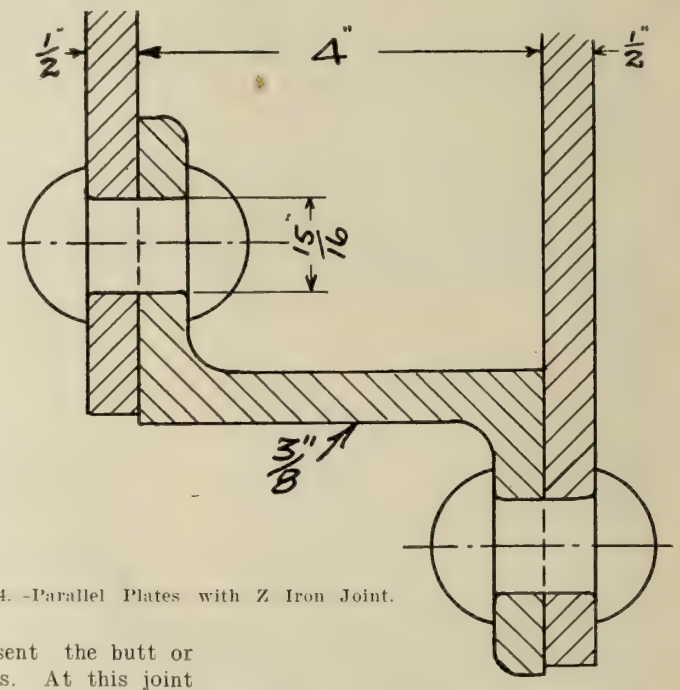


Fig. 4.—Parallel Plates with Z Iron Joint.

It will be noted that Fig. 1 represents the connection of two plates of equal thickness and in the same straight line. Fig. 2 shows two plates of equal length and thickness, parallel to each other, joined together by means of a channel

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* Part of a Course of an Instruction Course. A [illegible] will be given each month.

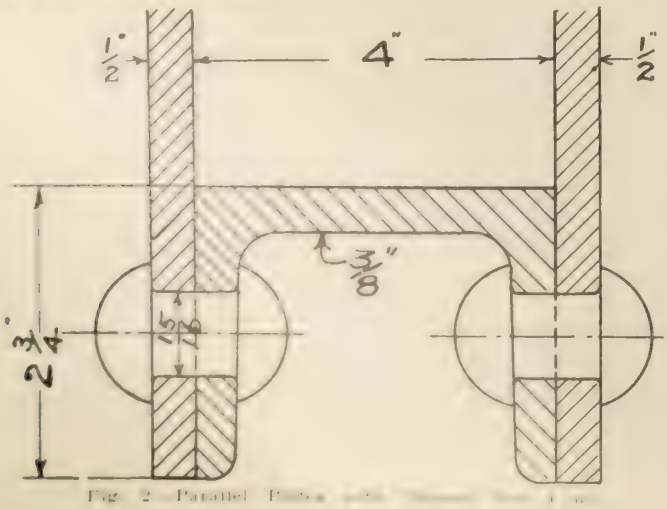


Fig. 2.—Parallel Plates [illegible]

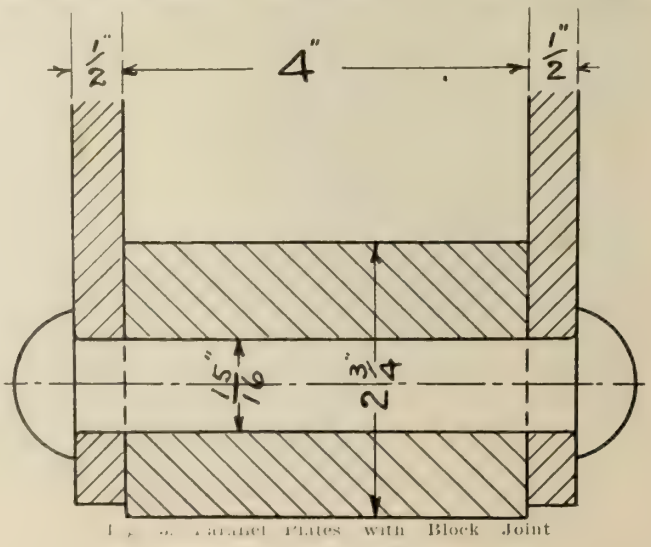


Fig. [illegible].—Parallel Plates with Block Joint

iron, while Fig. 3 represents like plate conditions with a solid piece or block joint. Fig. 4 represents two parallel plates of unequal length joined together by an Z. bar. All of these figures should be drawn full size and carry the same rivet head proportions to diameter as Fig. 1. The remarks on radii and position of rivets apply also as in Fig. 1.

The sectional shading shown on the sketches does not correspond with the illustration and instruction given in our previous article. You will, however, make it to correspond.

Instruction in making these drawings in pencil is more or less superfluous, they being to a large extent self explanatory. It will not be out of place, however, to say a few words on inking-in your drawing. Having completed the pencil work, the first thing to attend to in inking, is that of the radii. You will therefore put in the flange and web radii in each case, also the rivet heads, head and body freehand fillets. Having done this it is simply a case of drawing the straight lines with your squares and drawing pen to join up. In inking, begin at the top of your sheet and work down for horizontal lines, and at the left hand side of the sheet for vertical lines, working to the right.

The G.T.R. Car Shops, London, Ont., "Welfare" Dept.

By Halyard

In the March issue of "Canadian Machinery," the writer gave a brief outline description of the McClary Mfg. Co.'s "Welfare" scheme and its operation. The present article is written to show what one of our large railroad systems is doing along similar lines with the co-operation of its employes, in the same city, and forms one more link in the chain of evidence, which goes to prove the efficacy of such schemes, in securing and retaining satisfactory relationship between capital and labor.

THE G.T.R. car shops, London, Ont., exist largely for the repair and upkeep of freight and passenger cars, and are a centre or headquarters for this purpose in a wide and important section. A striking feature of the yards, buildings and equipment, is the cleanliness, tidiness and order prevailing; conditions which of themselves conduce to "welfare" and self-respect of employes, as well as hearty effort in the accomplishment of their work. The various shops are well lighted and ventilated, and have thoroughly modern lavatory accommodation whereby the employes at the close of the day's work may, if they so choose, erase all trace of the effects of the hours of toil, and leave for their homes feeling in good spirits, clean and satisfied.

Library and Dining Room.

Provision has been made for leisure as well as for working hours, and the wants of the inner man are also catered for. The library and reading room, Fig. 1, forms a section of a long one-storey brick building, of which the general offices, store rooms, dining room, fire station, paint shop, etc., also form a part.

The library leading dimensions are 60 by 30 feet; it contains 5,000 volumes of wholesome literature covering every field, and is supplied with the leading Canadian and American daily papers, as well as the brightest and best weekly and monthly magazines of both these countries and the Old Country. On either side and ends of the long central table are to be found revolving easy chairs for reading, and in addition to the papers and magazines already referred to, we noted a globe of the world, several sets of stereopticon views, etc. Concerts and entertainments for employes and their friends are held here, seating accommodation being provided for 300 people. The membership fee is 50 cents per annum, and the enrolment shows a total of 180. An annual concert in winter and excursion in summer provide means from their successful and profitable carrying out, whereby additions of books by purchase, are made to the library.

The walls are handsomely decorated, and are ornamented with pictures and groups of railroad officials and equipment, busts, etc. The interior woodwork is of southern pine in natural finish; with furniture of oak and oak-grained hardwood.

Drawing classes in winter for employes, having an enrollment of 50 and an average attendance of 35, form another attractive feature of the "welfare" department. Instruction in this course is given two nights per week in the library.

The dining room is the same size as the library and has attached to it a cooking and wash-up room 12 by 30 feet, Fig. 2. Meals are served at moderate rates and are largely taken advantage of by the men at the noon hour.

A committee of management looks after the library and dining room de-



Fig. 1.—Library and Reading Room, G.T.R. Car Shops, London, Ont.

partments, and is elected annually from among the members. Every Friday at noon the London Y.M.C.A. hold a meeting, at which one speaker and one singer are present for the instruction and entertainment of the audience, which is usually large.

Mr. Treleaven, the master car builder, and the other leading officials enter heartily into this "welfare" work, yet while naturally giving it the best of their time and effort, do not neglect National or Imperial interests when opportunity presents, as evidenced by the erection of a new and tall flag pole with a model railroad car on top and saluting of a new flag with due ceremony, followed by an employes' recreation field day, on the occasion of the coronation of our late King.

ECONOMY OF EFFICIENT FIRE PROTECTION.

The annual fire waste in America is appalling, exceeding $100,000,000 by conservative estimate. This estimate is for the actual loss of property, there being no data, of course, for the loss of wages and profits, and indirect business losses generally. The fire insurance companies, as a matter of good business policy, have brought about many reforms in factory construction designed to greatly reduce the fire risk. The growing use of concrete is another factor that should tend to reduce the proportional loss, though it is doubtful if the aggregate fire waste will show perceptible diminution in the next twenty years, or until a large part of the present wooden structures have burned or been torn down.

Among the means for preventing destructive fires, the sprinkler system, which originated in the needs of woodworking mills, is the chief. There is little chance for a fire started in a building equipped with sprinklers as prescribed by standard specification, to become a conflagration. The moment the temperature of the air surrounding the sprinkler head reaches or exceeds 160 degrees F., the fusible links melt, and the flow of water automatically starts. If the fire spreads, more sprinklers go into action and unless the conditions are enormous the flames are promptly extinguished.

The experience of a well-known manufacturing [illegible] of the Northwest is a good illustration of what this system means in saving insurance premiums. For several years the plant consisted of wooden buildings and being outside the city fire protection limit, the insurance rate was high, the premium being about $3,000 annually. The new building of semi-fireproof construction has been built and equipped with the sprinkler system throughout. The annual premium on twenty per cent. more insurance is only about $200. Counting ten per cent. interest and depreciation on the investment in the protection system, there still remains a large annual saving, and besides that the greatly added security of the business, which has required years of hard work to build up.—Machinery.

SHOP CHANGES DUE TO THE STEEL CAR.

The Railway Age-Gazette refers to the shop side of the steel car era as follows: "The introduction of the steel car in both passenger and freight service is rapidly transforming the equipment of most railroads and gradually changing the character of the car shops and making its impress upon the car department generally. The shops are becoming iron working shops with punches, shears and riveters, and the repair men are no longer carpenters and cabinet makers, but sheet metal workers and blacksmiths. The design of the steel car is an engineering problem, and most of the work can be handled better by the machinist or other iron worker than by the old-time car builder or woodworker. It is a remarkable fact, however, that the cabinet maker in the shops of the large passenger car builders has so adapted himself to the fitting of steel sheets, moldings and trimmings that his work is more rapid and accurate than the regular sheet metal workers."



Fig. 2. Dining Room, G.T.R. Car Shops, London, Ont.

EDITORIAL STAFF ADDITION.

A change in the personnel of our editorial staff made necessary the appointment of a new associate editor, and we have been fortunate in securing the services of Mr. J. H. Williams, late assistant shop engineer, C. P. R. Angus shops, Montreal, to fill the position. Mr. Williams brings a weight of practical machine shop methods and practice to the service of our trade publications, particularly Canadian Machinery, and our readers may rest assured of their interests and requirements being carefully looked after in the future.

Mr. Williams served his apprenticeship with the North British Locomotive Co., Glasgow, a corporation employing 8,000 men, and turning out 700 locomotives per year. He worked as draftsman with J. H. Carruthers & Co., Polenadie Pump Works, with Watson, Laidlaw & Co., makers or hydro-extractors, centrifugals and sugar machinery, and with Kerr, Stuart & Co., Stoke-on-Trent, England, as leading draftsman. He came to Canada four years ago, and has been employed at the C.P.R. Angus shops, Montreal, until joining our staff, first as draftsman and then as assistant shop engineer. His technical training was received at the Glasgow and West of Scotland Technical College, an institution of world-wide fame in the matter of staff, equipment and quality of instruction imparted.

Boiler Design, Construction, Operation, Repairing and Inspection *

By H. S. Jeffery

Repairing Tubular Boilers.

(17) The repairing of a tubular boiler is a simple matter—a very simple matter. The chief consideration is to make the repair so as to weaken the boiler as

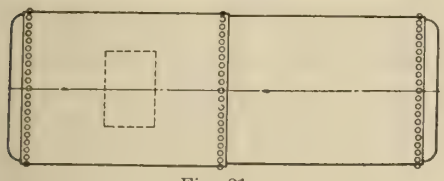


Fig. 21.

little as possible, and to apply the patch in such a manner so it will serve as near as possible the part it replaces.

The applying a patch to any boiler in such a manner as will necessitate the work being done over within a short time, which usually means more extensive repairing in the second instance, is due to two reasons, and they are: Haste and incompetency on the part of those making the repairs. The incompetency in this instance, means lack of knowledge of boiler reconstruction, or in other words the repairing of a boiler in a practical manner.

Take for instance a tubular boiler. Now, if the shell sheet is to be patched, the hole in it should never be cut as shown in Fig. 21; it should be cut in the manner indicated in Fig. 22. The sharp corners of the hole, Fig. 21, will permit under the panting or the breathing of the boiler the shell plate to crack from the corner into the solid plate Also, since the patch would be applied with a single riveted joint, the cutting of the hole in the shell plate, as shown in Fig. 21, would place in the longitudinal plane a single riveted lap joint, which, of course, would have an efficiency greatly below the efficiency of all other joints in the same plane.

The manner of installing the hole in a shell plate, as shown in Fig. 22, over-

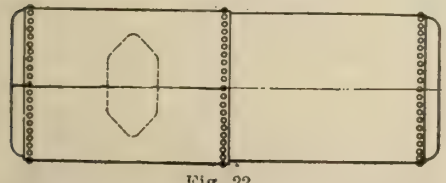


Fig. 22.

comes cracks into the solid plate as previously mentioned. In addition, it will be noted, in Fig. 22, that there is no single riveted lap joint in the longitudinal plane. The hole in the shell plate, Fig. 22, permits a single riveted lap joint in the transverse plane, and the rivets should be so pitched so the efficiency of the joint of the patch is the same as the girth seam of the boiler. It will be noted that a portion of the single riveted lap joint would be diagonal, which is the best arrangement that can be made, and one which is to be preferred to the single riveted lap joint in the longitudinal plane.

Inside and Outside Patches.

(18) A subject which boilermakers do not altogether agree upon is the method of applying a patch to the bottom of a tubular boiler. Some boilermakers believe in applying a patch inside the

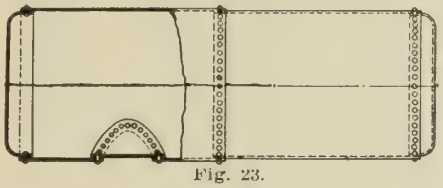


Fig. 23.

boiler as shown in Fig. 23, while others believe in applying the patch on the outside of the boiler as shown in Fig. 24. The latter practice, however, is more universally used than the former practice, and this notwithstanding the fact that a place or recess is created for the collection of mud and foreign substances.

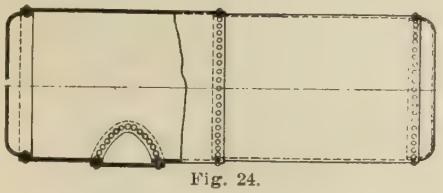


Fig. 24.

A patch applied to the bottom af a tubular boiler, whether applied inside or outside of the boiler, should never be applied with patch bolts. Patches can be readily and safely applied with patch bolts to the fire-box or furnaces of locomotive boilers—and for the reason that there is but little strain on the plate from the centre of the rivet hole to its edge. This is not true, however, with a patch as applied to a tubular boiler, per Figs. 23 and 24. They should be riveted.

The patch as applied in the manner as shown in Fig. 24, can be brought "home"—that is, brought metal to metal against a shell plate, more tightly than if applied in the manner as shown in Fig. 23, Further, the installation of the patch, Fig. 24, can be more readily and cheaply installed than the patch, Fig. 23, and practice has shown that it is

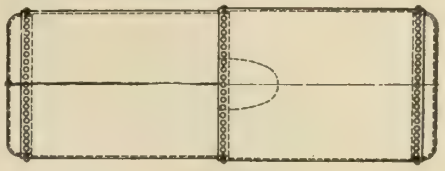


Fig. 25.

better to calk patches to the shell plate instead of the shell plate to the patch. If the boiler is clean, as it should be, no difficulty should be experienced by mud and foreign substances collecting in the recess patch applied as shown in Fig. 24.

Reference has already been made to the cutting of hole for patch on the shell plate. Frequently the shell plate will crack adjoining the girth seam. In such cases the hole should be cut as shown in Fig. 25, and not as shown in Fig. 26—and for the same reason as given in regards to Figs. 21 and 22.

It is not practical to apply the patch to the inside or outside of the boiler and not cut out the defective part when said defective part is in contact with the flames or hot gases. A crack might develop in—say the dome—and in this case a patch could be applied over the crack or defective part without removing same. However, that portion of the shell plate of a tubular boiler in contact with the flame and hot gases, should not and cannot be repaired by applying a patch without removing the defective part of the shell plate. If the patch is applied without removing the defective part, the double thickness of the plate at that point will result in the plate becoming overheated and the patch's length of service will be of a very short duration—

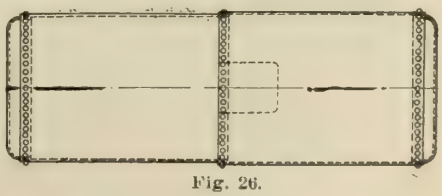


Fig. 26.

less than a day. It is very essential that the underlying principles of the foregoing should be understood, and when understood the repairing of boilers will be a simple matter.

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MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

DISC GRINDING.

By J. A. Bradley

The wide application and economy of disc grinding is not as thoroughly appreciated by manufacturers of interchangeable or duplicate parts in this country as in others, and for the comparatively slow development of this method of reducing the surfaces of metals, the makers of disc grinding machines are themselves largely to blame.

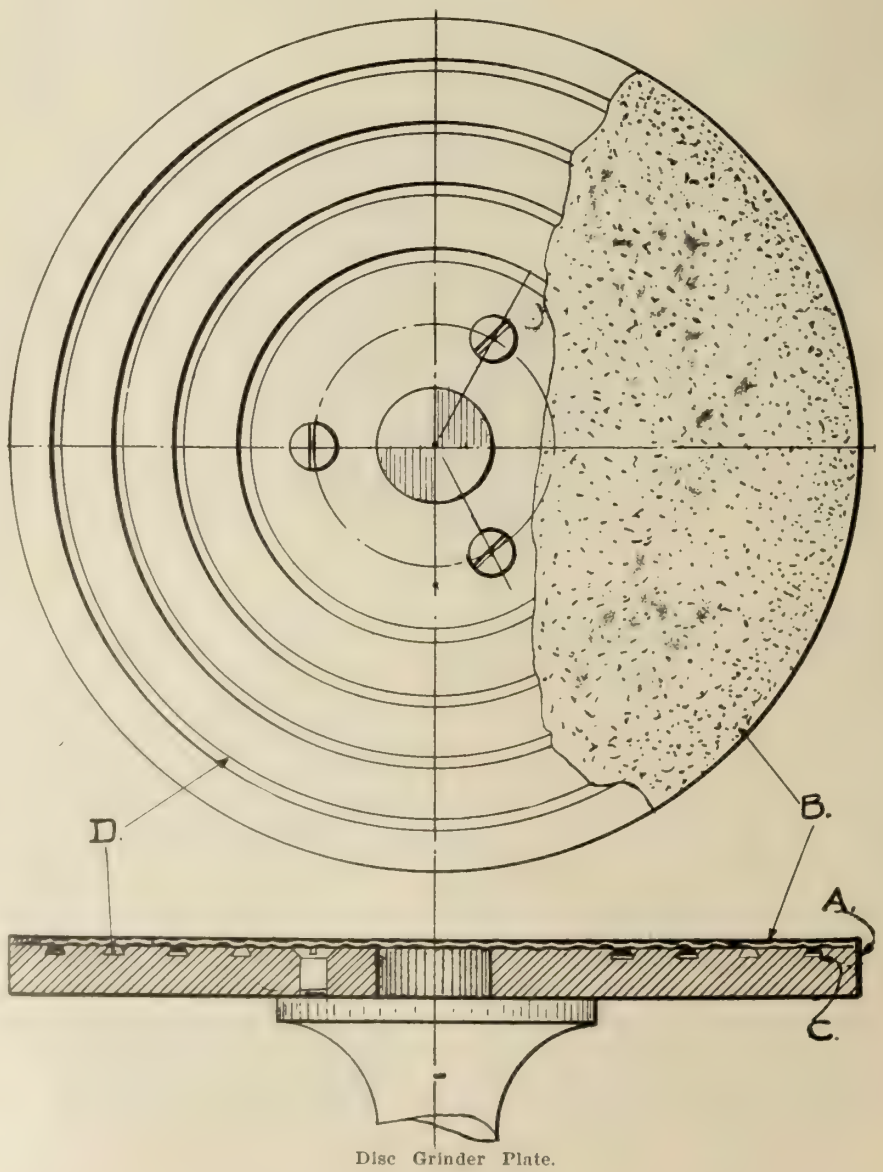
The broad claims made by these firms in regard to economy of operation in the use of unskilled labor has greatly retarded its progress, also the early machines sent out were poorly designed, not having sufficient weight for the high speeds at which they operate, and they soon shook themselves to pieces. The use of unskilled labor for what appeared to be a simple operation soon increased the size of the scrap heap and disproved one of their strong talking points. It also showed that disc grinding requires much skill.

It is true that the use of unskilled labor may be developed in a comparatively short time, starting at the more simple operations and advancing step by step, but if many machines are to be operated the constant supervision of a skilled operator is necessary. The failure of unskilled labor to operate these machines as claimed by the makers, the high cost of maintenance because of poor design, and the difficulty of attaching grinding circles to the plates so that they would remain until worn out, soon developed a prejudice that has not been easily overcome.

Of these conditions all but the latter have become better understood and improved, and while special adhesives for this purpose are available the trouble remains. Another object to overcome that remains, and which met with very little success, was to cut upon the face of the plate a half-round spiral groove. The settlement of this condition against the successful operation of disc grinding will be better understood when one reflects upon the cost of these circles when purchased ready made up in the plate, and that after one has run after a few hours use in machines as far as disc grinding is concerned is totally destroyed as it is next to impossible to replace it.

The accompanying drawing shows a disc grinder plate that has been in use for several years, and while the idea is not new (a patent having expired in March 1910) very few interested in disc grinding seem to have heard of it. It entirely overcomes the difficulty, keeping the grinding circle perfectly flat against the plate until completely worn out. In fact, in making a test as to the relative merits of a plate made as shown and one having a half round spiral groove cut on the surface, it was necessary to use hammer and chisel in order to remove the circle held on with ordinary glue, while the spiral groove plate was coated with a special glue and the grinding circle could be removed quite easily by hand.

In the illustration, "A" is the grinding plate, "B" the grinding circle or surface, a portion of which is shown in the plan view, and "C" the glue or other adhesive substance. It will be observed that there are a number of radial dovetail or undercut grooves "D" cut in the surface, the number depending upon the diameter of the disc. These may be cut upon both sides and grinding discs placed thereon, so that when one wears out the other side may be turned out. In using a plate cut in this way grinding discs may be fastened with an ordinary stiff paste of flour and water, and the grinding disc will last until completely worn out, and when it is desired to replace it, it is only necessary to immerse in boiling water in the usual way, when all the glue or paste will come out.

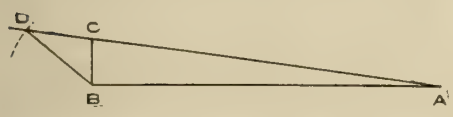


Disc Grinder Plate.

AUTOMATICALLY PRODUCING CONICAL SURFACES ON A BORING MILL.

By J. H. Williams.

Some time ago, in the shops with which the writer was connected, the problem presented itself of facing some concave and convex conical surfaces by means of a boring mill. The angle which the slope of the cone made with the vertical was greater than 45 deg.,



Layout Diagram—Automatic Conical Surface Producer on Boring Mill.

therefore the method now described was adopted. It may prove of interest to readers of Canadian Machinery, especially as a way has been devised for accurately determining the amount the tool-bar has to be swung over from the vertical position to produce various angles, without employing any "cut and try" methods. The half-tone illustrates one of the jobs in question, and it will be noticed that the head is set over very little, although the angle made by the slope is 63 deg. with the vertical. This is accomplished by using a combination of both the vertical and horizontal feeds, and further by using only the vertical feed on the head doing the work, and the horizontal feed on the other head. Such a method was necessary for two reasons; one being the construction of the machine, which allows only equal feeds in each direction when both feeds are obtained from the one head, and the other that this arrangement enables the proportion between the two feeds to be varied. Thus, we may get for instance, 1-16 inch feed in the downward direction and 1-8 inch or more in the horizontal, or any other combination which is permitted by the feed gears on the machine.

The two heads are connected by a bar, as shown in the half-tone cut, which has the effect of practically making the two into one. On some machines the nut which engages with the horizontal feed screw is made in halves and can be opened and closed at will. On others again the nut is solid, and where this is the case, it is necessary to remove the horizontal feed screw from the head carrying the tool, so that it may be free to move across horizontally under the pull of the other head, exerted through the coupling bar. The next thing is to determine the angle through which the head which carries the tool must be swung in order to produce the required slope. As far as the writer is aware, the following graphical solution of this problem has not previously appeared in print.

Construction of Diagram.

Referring to the figure, we lay off a straight line AB, equal to the radius of the base of the cone to be turned. At B erect a perpendicular BC, equal to the vertical height of the cone. From B lay off a line BD cutting the line AC produced at D. The length BD must bear the same relation to the length AB that the downward feed of the tool bears to the horizontal feed. The angle CBD is the angle which the tool-bar must make with the vertical in order that the tool may follow the slope DCA. Example: suppose we have to turn a cone the radius of whose base is 15 inches and whose vertical height is 2 inches, we first settle upon some ratio for the two feeds. Let us assume 1-32 inch downward and $\frac{1}{8}$-inch horizontal feeds per revolution of the work, which is a ratio of 1 to 4.

Laying out our diagram we make AB equal to the radius of the base of the cone, or 15 inches, BC equal to the height, or 2 inches. As already mentioned BD is to AB as the downward feed is to the horizontal traverse; that is to say, BD must equal 15, divided by 4, or $3\frac{3}{4}$ inches. From B strike a radius equal to $3\frac{3}{4}$ inches, and call the point where it cuts AC produced, D. Join BD and by trigonometry or by measurement find the size of the angle CBD and set the tool-bar this amount off the vertical.

If the ratio of the two feeds is the same as the ratio of the height of the cone to the radius of its base, the tool-bar is not swung over at all, but stands vertical.

The half tone illustration shows the method being applied to the turning of a conical piston head, often a more convenient way than chucking such a job in a face-lathe; and having the advantage of producing the slope automatically.



Automatic Turning of Conical Piston Head on Boring Mill.

INCREASING PLANER CAPACITY.

By Donald A Hampson

Our shop had a most adequate equipment for planer work and compared more than favorably with any other for twenty or more miles around. Despite the fact that the squeech of the planer belt was rarely stilled, we were so burdened with orders that a goodly pile of castings always lay around waiting their turn to be machined. As foreman, I was chairman of the ways and means committee, and therefore supposed never to be at a loss for an expedient.

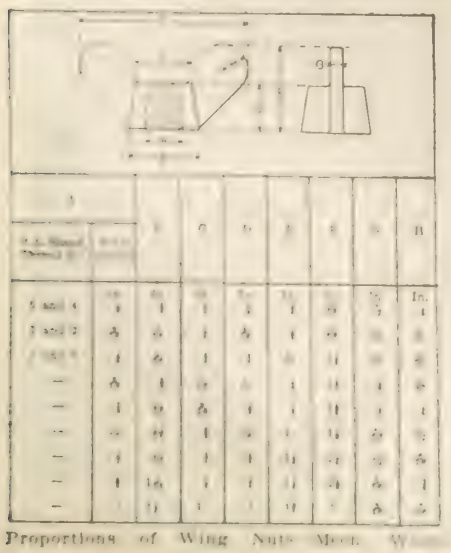
One of the planers had two heads on the cross rail and a 15-foot bed, so to it I looked for double service. How I got it, may be gathered from the illustration which shows a job set up on each side of the bed, one a straight



Increasing Planer Capacity.

racing job, the other a 55 degree angular cut on grey iron castings, 7 feet long. With a shorter planer, only one casting could have gone on at a time, and of course, no extraordinary progress would have resulted.

The feed naturally was not what one might term ideal with both heads in operation, still it was pretty close to it, and the net result was a rapid clearing up of the castings pile on the floor. This



Proportions of Wing Nuts Used.

method requires work of a somewhat related form, and within certain limits as to size.

To still further "cut time between acts," as Bullard says, I had two men set up the work and remove it when finished, thus making the most of the work producing hours available.

MAKING PERFECT BLUE PRINTS.

Many novel and patented devices have from time to time been designed for the purpose of ensuring clear blue prints when printing in large frames. One of the simplest of these has been in use in a Belgian factory for many years, and has proved satisfactory in every way. In this factory the prints, which are in many cases of huge steam engines, have to be made of exceptionally large size, and the difficulty of ensuring perfect pressure of the paper in the frames is overcome by using thin rubber cushions the size of the frames, which are placed between the paper and the wooden back. Air is then blown into these cushions by means of the mouth, which gives just sufficient pressure to ensure perfect contact, without bulging the wooden back or the large glass front of the frame. By using this simple device the largest prints can be produced with perfectly sharp lines all through, and spoiled and blurred prints are entirely avoided.—The Dodge Idea.

A SIMPLE ARBOR FOR THIN SAWS.

By Chas. Hattenberger.

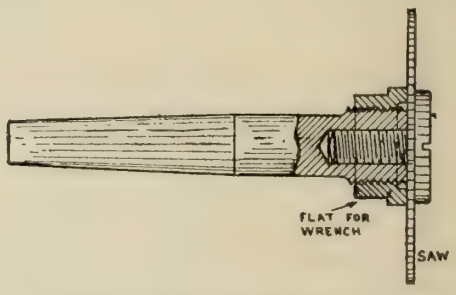
The accompanying cut shows a simple and efficient type of arbor for thin circular saws used for metal slitting.

The taper shank is made to fit the milling machine spindle and the two screw threads are of opposite hand. Thus if the saw is to revolve in a right-hand direction, like the hands of a clock, the outer thread and nut are made right-handed, while the centre screw is made left-handed. The strain on the saw has a tendency to make the nut and screw close in towards each other, and the greater this strain, the tighter the grip.

HOW TO CUT CURVE ON PLANER.

By H. D. Chapman.

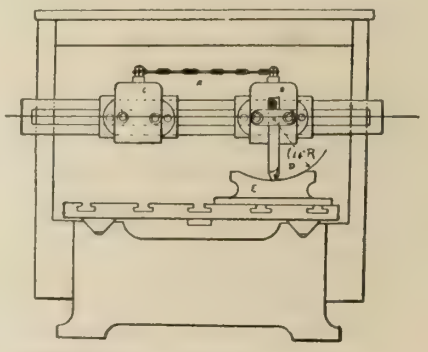
A number of castings were recently brought to the shop where the writer works. Each casting was to be finished 24 inches square, and had to have a 14-inch radius cut through the center as shown at E in the accompanying drawing. The job was too large to clamp on the lathe carriage and allow for a cut of 14-inch radius, so after a little thought we rigged up the planer as shown in the accompanying drawing. Five of the castings were clamped on the machine at a time, and the job was soon finished. The tool was set central with the casting. The planer head B was locked to the cross beam, but the swivel was left free to turn. The head B was connected to the head C by the chain A. The cross feed was put on the



Simple Arbor for Thin Saws.

head C, and it swung the head B and the tool through the desired sweep. A first-class job was done in a very short order.—Scientific American.

It's a good plan to assume that the builder of a machine knows a little about it and that it will pay to follow his instructions, at least till you have found a better way. If any directions seem complicated, it is a safe bet that there is a reason for it. No sane builder wants to make it any harder than necessary to learn how to operate his machine.



How to Cut a Curve on a Planer.

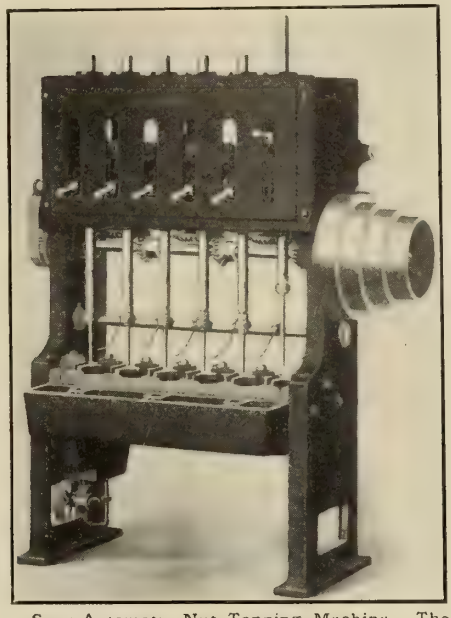
DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, and Blacksmith Shop or Planing Mill.

SEMI-AUTOMATIC NUT-TAPPING MACHINE.

The National Machinery Company, Tiffin, Ohio, manufacturers of bolt, nut and forging machinery, have perfected a new design of Semi-Automatic Nut Tapping Machine, which is shown in the accompanying illustration. In this new tapper, rough hot pressed nuts are tapped as readily as cold punched nuts, and the objections against the purely automatic tapper, due to "sticking," etc., when small burrs are encountered on rough hot pressed nuts, is overcome. The tap spindles in this design are raised and lowered automatically, and the machine "sets the pace" for feeding. The operator does not experience fatigue, as on the foot-lever tapper, due to treadling, is able to easily keep pace with the machine during the day, and secure the maximum output. Outputs on this machine range from 60 to 80 per cent. greater than are possible on the foot lever tapper.

The revolutions of the tap spindles raising and lowering, can be varied to correspond to the number of threads on the tap being used. This eliminates "non-productive" tapping time, tap running idle in the nut after it is tapped, and quickens the "pace" for feeding, set by the machine. The variations in the revolutions of the tap spindles are secured through a single lever quick-change speed box on the cam shaft. The raising and lowering of the tap spindles is accomplished by six three-step cams carried on a horizontal shaft in the rear of the spindle housing. These cams engage with hardened steel rolls carried in the spindle levers. The cam shaft shifts laterally, so that the various cam faces or steps can be engaged; in this way the "staying" or resting time of the tap when raised, can be altered to meet the needs of the operator for feeding the machine and emptying the taps. The life of the tap also, is longer than generally experienced in the foot-lever tapper, as the cam movement causes the tap to lower gradually, instead of dropping into the hole with the weight of the spindle back of it, causing it to bind, and resulting in broken taps, stripping of threads, etc., so common in the operation of the foot-lever machine.

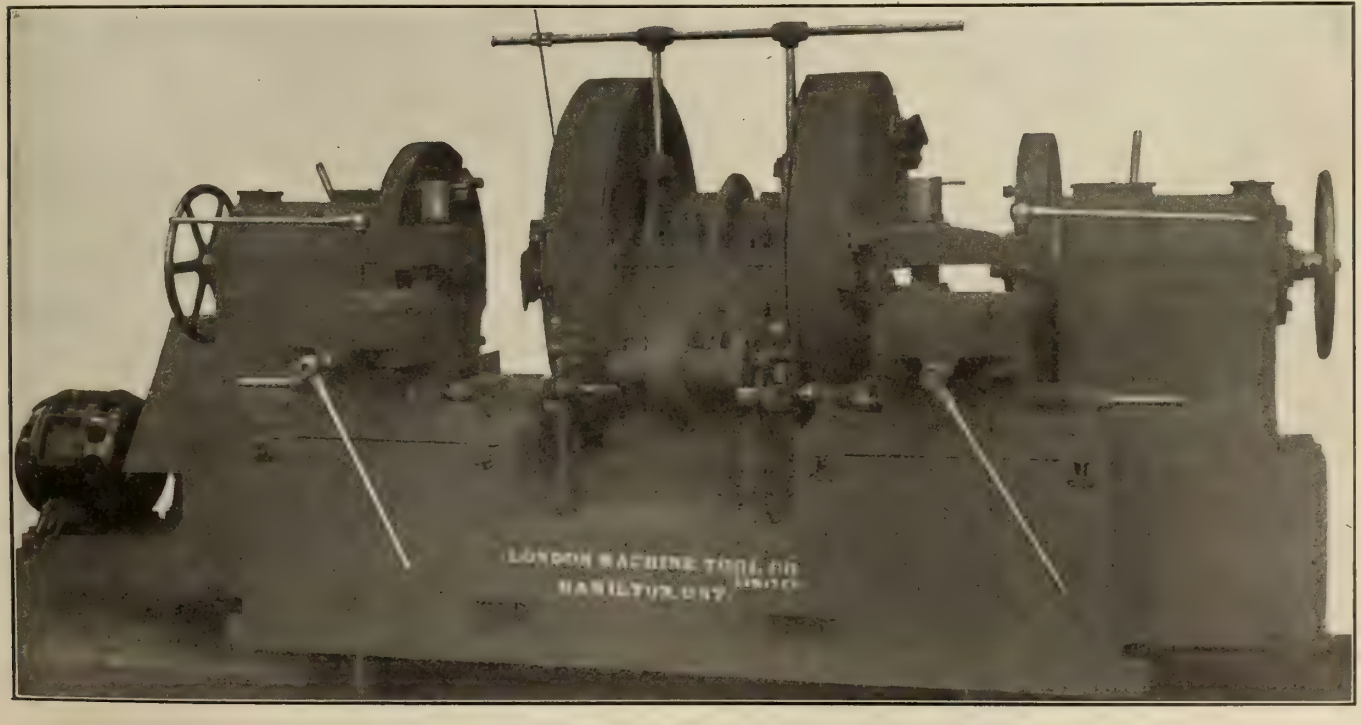


Semi-Automatic Nut Tapping Machine. The National Machinery Co., Tiffin, O.

An automatic socket allows the tap to be removed or inserted while the machine is running, and ejects the tap automatically when the shank becomes filled with tapped nuts. This new design is built in 1 inch capacity with six spindles, and 1½ inch capacity with ten spindles. National Circular 1010, gives a full description of the machine, which together with a National wedge Grip bolt header and new friction-slip fly wheel, a National quadruple bolt cutter and National die sharpener, all of direct motor drive designs, can be seen in operation at the Master Mechanics' and Master Car Builders' conventions, Atlantic City, June 14 to 16, and 19 to 21 respectively.

COACH WHEEL LATHE, THE G. T. R. SHOPS, MONTREAL.

There was recently put under test at the G.T.R. shops, Montreal, a 42-inch coach wheel lathe, illustration and leading features of which, together with



42-inch Coach Wheel Lathe at G.T.R. Shops, Montreal.

data of the test are herewith described. The test was run under the supervision of J. Coleman, car shop superintendent, G.T.R. System, and W. Pitt, foreman of car shops, G.T.R., Montreal. The results constitute what is believed to be a world's record, and have an added value and importance from the fact that this machine was the first of its particular type. It is believed that later productions will show still more satisfactory results, and while only of recent introduction on the market, installations have been made by the Grand Trunk Pacific, Temiskaming and Northern Ontario Railway, and the National Transcontinental Railway.

Description of the Lathe.

The machine is of an extra heavy type, designed for turning out railway coach wheels at a rate heretofore unobtainable. The driving mechanism consists of 2 face plates, 56 inches in diameter, having opening cut in same on one side, to admit of axle; each driven by an internal gear of steel of coarse pitch. The spindle is 16 inches in diameter, and has 2 bearings 14 inches long, accurately scraped. It is open on one side to admit the largest axle required, and the construction of the machine relieves it of all torsion. The bearings are bronze bushed. The pinions meshing into the internal gear are steel, the teeth being cut from the solid. The bearings supporting these gears are phosphor bronze, and are 5⅞ inches in diameter by 11 inches long.

The centre head supporting the 2 internal gears has a wide bearing on the base, and is secured to it by heavy bolts and dowels, making an exceptionally rigid construction. The method of taking the insert is very simple, there being two screws to loosen up, and the section to drive out. The shape of the gear ring also tends to rigid construction by which there is no vibration. To the face plates are secured drivers of the latest approved form, giving ample driving capacity to the machine. The [illegible] spindles of large diameter, [illegible] powerful self-[illegible] for gripping the [illegible] are adjustable in and out on a distance of 12 inches, and are moved by motors or screws operated by buttons on each end. These motors need not be over 2 h.p. capacity each. The [illegible] and rests are extremely massive, and provided with means for quickly releasing tool and securing it in position. The feeds are four in number, and vary from [illegible] to [illegible] of an inch per revolution. Ample room is made for the work required. The base is stiff and deep, with ample [illegible] for bolting the work to foundation.

Advantages of this machine are that the power is not transmitted through an open side shaft. The strain is transmitted entirely through the gear; the bearing having only a steadying action and no transmitting function. There is no worm gearing to absorb energy, and the heads being moved backwards and forwards by power, the attendant is relieved of much incidental trouble. The tool post is of a powerful type, and is operated by a large screw of coarse pitch, having differential threads. The weight of the machine is about 55,000 pounds, and its recommended driving equipment is a 40 h.p. variable speed motor, with speed variation 3 to 1, or a constant speed motor giving 2 speeds, 10 and 16 feet, by means of friction clutches.

Pairs of Wheels	Time Putting Wheel in Lathe	Actual Turning Time	Time Removing Wheel	Total Time
1st	3.50 2/5	6.19 4/5	2.49 4/5	13.00
2nd	3.40 2/5	6.19 3/5	3.00 2/5	13 00 2/5
3rd	8.25 4/5	7 34 1/5	4.00 1/5	15.00 1/5
4th	3 30	5.41 2/5	2.48 1/5	11.59 3/5
5th	3.34 2/5	7.15	2.40 4/5	13 30 1/5
6th	3.36	6.55 2/5	3.28 1/5	13.59 3/5
7th	4.15	8.15 2/5	3:00	15.30 2/5
8th	3.59 2/5	6.45 1/5	3.15 2/5	14.00
9th	4.51 2/5	8.48 4/5	4.20	18.00 1/5
10th	3.55 1/5	11.12 1/5	2.52 2/5	17.59 4/5
11th	3.36 1/5	6.46 4/5	2.37 1/5	13.00 1/5
12th	3.34 2/5	10.05 2/5	4.20 2/5	18.00 1/5
13th	4.49	7.21 3/5	3.19 1/5	15.29 4/5
14th	3 37 3/5	7.15 4/5	3.26	16.09 2/5
15th	3.21 3/5	8.55 4/5	4.02 3/5	16.20
16th	3 47 3/5	9.31 4/5	3.00 3/5	16.20
17th	3.58 3/5	7.20	5.06 2/5	16.25
18th	3.57 3/5	6.26 4/5	3.10 3/5	13.35
19th	2.53 2/5	6.54 1/5	4.17 2/5	14.10
20th	3.21 2/5	7.06 1/5	4.02 2/5	14.30
21st	2.45	6.49 1/5	2.41 1/5	12.15 2/5
22nd	3.14 3/5	5.49 4/5	2.36 4/5	11.41 1/5
23rd	2.36 1/5	7.00	3.10 3/5	12.46 4/5
24th	3.25 2/5	6.38 4/5	3.39 4/5	13.44
25th	2.56 1/5	6.13 4/5	2.36 2/5	11.46 2/5
26th	2.29 2/5	7.55 2/5	3.46 1/5	14.10
27th	2.45 2/5	7.38	3.06 3/5	13.30
28th	4.06 1/5	7.38	2.46 1/5	14.30 2/5
29th	4.28 2/5	10.53	2.17 4/6	17.39 1/5
30th	2.39 2/5	9.39 2/5	3.39	15.57 4/5
31st	3.05 2/5	8 31 1/5	2.43 3/5	14.19 1/5
32nd	3.18 1/5	8.33	2.45 3/5	14.36 4/5
33rd	4.24 4/5	8.21 4/5	2.11 4/5	14.58 2/5
34th	3.15 1/5	6.29 1/5	2 28 1/5	12.12 3/5
35th	2.43 2/5	6.51 4/5	2 09	11.44 1/5
36th	3.13 1/5	8.23 1/5	5.45 4/5	17.22 1/5
37th	2 57	9.56 2/5	2.28 4/5	15.22 1/5
38th	3.34 2/5	8.29	2.33 3/5	14.37
39th	2 46 2/5	7 46	2.24	12.56 2/5
40th	2.58 1/5	7.43 1/5	2.22 4/5	13.04 1/5
	2.21.12 4/5	5.10.10 3/5	2.07.51	9.39.14 2/5
Average	3.31 4/5	7.45	3.06 1/5	14.23 4/5
Minimum	2.29 2/5	5.41 2/5	2.09	11.41 1/5
Maximum	5.27 3/5	11.12 1/5	5 45 4/5	18.00 1/5

Test Data, 42-inch Coach Wheel Lathe.

Test Particulars.

The machine was operated during the test by two mechanics and two helpers, while another man took electrical readings. The wheels were Krupp B.V.G. Pairs 1 to 31 were 38 inches, 5x9 wheels, pairs 32 to 40 were 38 inches, 4½x8 wheels. The forty pairs of steel tired wheels were turned out in 9 hours and 35 minutes, and the tools used, only required one grind for the entire operation.

The lathe is manufactured by the London Machine Tool Co., Hamilton, Ont., and has been developed in its leading features, which are patented, by the general manager of the company, E.G. Yeates.

A NEW OPENING DIE.

A departure from previous designs allows this die to be operated while being revolved. It is designed particularly for use on screw machines where the threading spindle is revolved. In addition, there are several other important features which have been carefully covered. The chasers can be removed from the jaws without displacing any of the other parts, and are so designed that they will cut a practically perfect thread without the use of the follow-up cam; a very essential point when used on the rotating spindle. A liberal adjustment for size is provided in the cam arrangement on the chaser blocks, and this is controlled by a fine pitch screw with micrometer graduations plainly marked.

The jaws holding the chasers, and the cam surfaces controlling the closing of the die are hardened and ground with a wide bearing on the cam surface, which holds the jaws firmly in position when the die is closed. No springs are connected with the parts on which the adjustment of the dies or the operation of the closing cams depend. As shown, this new design of die requires a small number of parts and these are so arranged as to make it easily taken apart and reassembled, although this is seldom necessary, as the head cap prevents chips entering the working parts, and the internal arrangement of the head leaves plenty of room between, except in the matter of the cam faces and the surfaces they bear on. Grit carried by the oil and other foreign substances works into these clear spaces and out of the head through holes provided for the purpose in its sides. The die may be thoroughly cleansed by simply removing the cap "H" from the front face and washing in oil or compound. No other parts need be removed. All details of the die are made interchangeable, to facilitate reassembling or replacement of worn or broken parts.

This die has been developed by The National Acme Manufacturing Company, of Cleveland, for use on their Acme automatic multiple spindle screw machines and other machines with revolving threading devices, after over two years experimenting with the standard makes of die heads and departures from same.

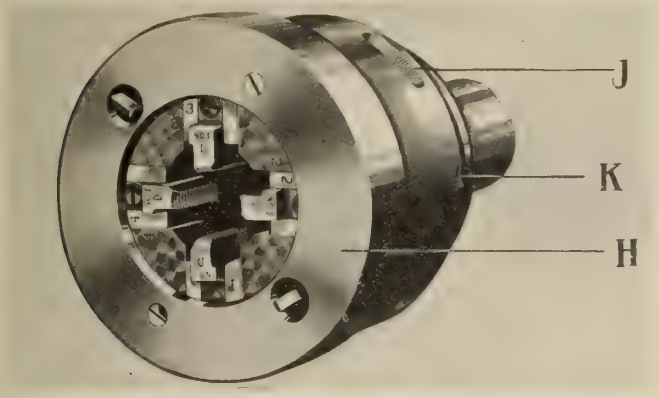
Die Detail.

A—Body holding the working parts.
B—Head holding the chaser blocks.
C—Cam operating block.
D—Chaser block, with cam for adjusting milled on rear end.
E—Chaser which can be removed by removing screw "F" only.
F—Screw holding chaser.
G—Screws holding B to A.
H—Cap protecting working parts from chips, etc.

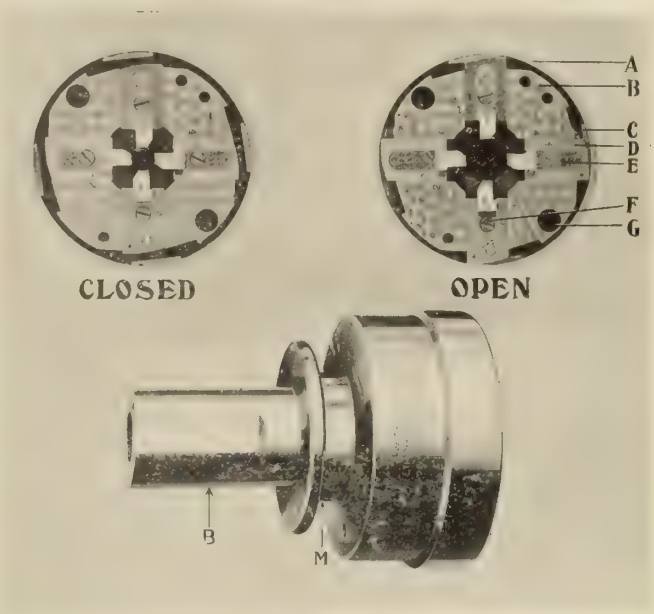
K—Adjusting screw.

J—Micrometer graduations for adjustment.

M—Groove for closing shoe.



New Opening Die.—The National Acme Mfg. Co., Cleveland, O.

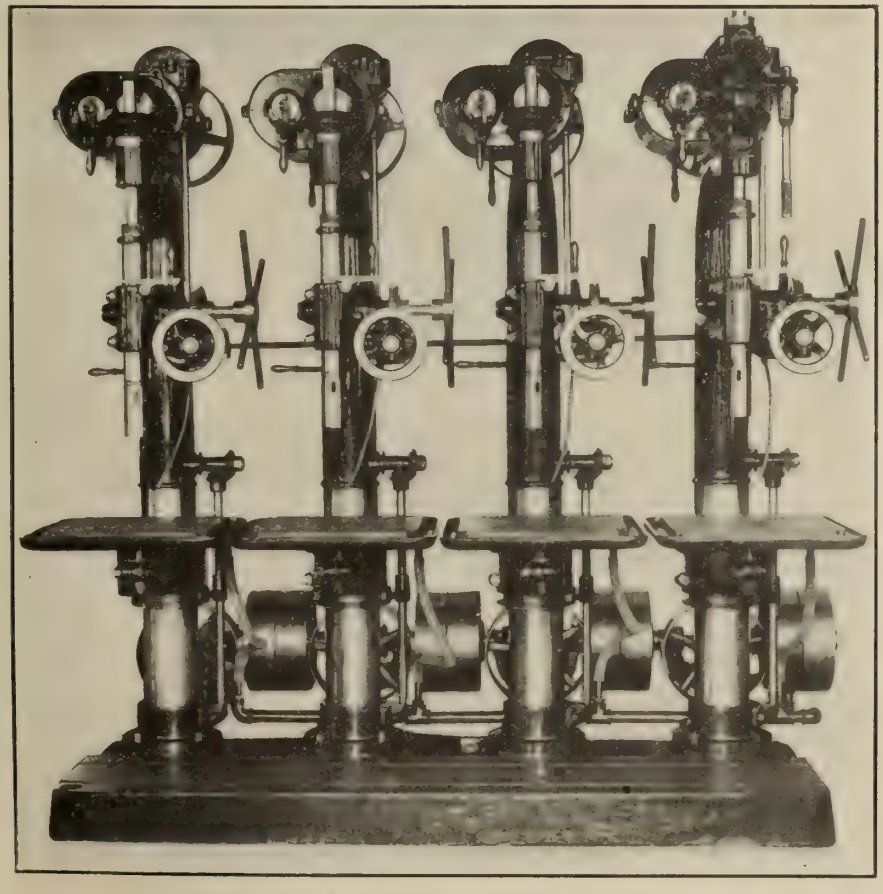


A New Opening Die—The National Acme Mfg. Co., Cleveland, O.

SIBLEY FOUR SPINDLE HI-SPEED DRILLING MACHINE.

In this four-spindle Hi-Speed drilling machine made by the Sibley Machine Tool Co., South Bend, Ind., there is endeavor to combine all the features which add convenience and effectiveness without undue complication. The individual square tables are close together and can either be used as one table for the whole machine or any one of them may be raised or lowered to accommodate different size jigs. Each spindle is independent of the others in operation, and each has its separate quarter turn countershaft, instead of single clutches for each machine. This method of drive has been selected with the idea of delivering the full amount of power to each machine, and to eliminate the troubles incident to the use of friction clutches. A gear pump driven from one of the countershafts supplies lubricant from a large tank to all four spindles, and to this tank all the lubricant returns through drains on each table. The usual geared tapping attachment is fitted to the fourth spindle.

Distinctive features of these machines are their direct drive, and gear case location on top of the column. The operator can take care of all four spindles, without being obliged to go around back or side of the machine for speed changes or adjustments. The machine may be started and stopped, speeds and feeds changed and spindle returned, from directly in front. The same type is manufactured with two or three spindle arrangements.



Sibley Four Spindle Hi-Speed Drilling Machine.

THE BOND HANGER AND COUPLING CO., ALEXANDRIA, ONT.

Mr. Charles Bond, Philadelphia, Pa., president of the Bond Hanger and Coupling Co., Alexandria, Ont., visited the plant a few days ago, and presided at a meeting of shareholders. Mr. Bond represented the American interests, while those of the Canadian end were looked after by H. Munro and J. McIntosh. M. H. Graham was appointed secretary-treasurer and general manager. The report of business done since the inception of the company and commencement of operations was considered highly satisfactory, and in view of the likelihood of a substantial and steady business increase in the near future, steps were taken to add to the machine equipment so as to cope with it.

Before kicking about failure of societies and associations to live up to your expectations, just hold a little inward communion with yourself, somewhat along this line: "What have I contributed toward exchanging expectations for results?"

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all uses of power developed from steam, gas, electricity, compressed air and water in Canada.

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FRANCE
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Cable Address:
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SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. VII. June, 1911 No. 6

CANADIAN MACHINERY.

With this issue of Canadian Machinery, Mr. Peter Bain assumes responsible editorship. Needless to say Mr. Bain's long practical experience in the various departments of machine shop work, his success as a designer and his thorough technical training, eminently qualify him for the position.

Mr. J. H. Williams, asst. shop engineer, the C.P.R. Angus shops, Montreal, becomes associate editor, and he too brings to the work of our paper, a wide and comprehensive knowledge of the most modern machinery practice. On another page will be found a brief account of Mr. Williams' training and experience.

We bespeak our readers' co-operation by correspondence, inquiry and contributed articles in our editorial work.

A QUESTION OF ENDURANCE.

Machines are designed to perform certain operations involving great accuracy with rapid output, and much ingenuity is displayed in the arrangement of the various mechanisms which lead to successful attainment. Does the active material, if we might so term it, receive that care in selection of kind and quality, to put it on a par with the other effective features, or may it be left unwittingly the weak link in the chain? It does seem that the latter is in many cases an existent condition, and as a consequence, much skill in design or accuracy of workmanship, becomes wasted immediately the machine or its detail gets into service.

Gear wheels strike us as being pertinent examples of elaborate precaution taken to secure correct form teeth without due regard to teeth material in the light of operating conditions. Wheel teeth although perfect in form will remain so through a brief period of operation, and the beneficial effects looked for, will have disappeared long before the life of the wheel is over, unless steps are taken to secure material which will not only stand up to the work by its quality, but will make appear reasonable and right the time and skill expended on teeth form.

Many examples might be quoted to show the inconsistency of spending much labor and skill on material unworthy of and unsuitable for its selected service, and our drawing attention to the subject, may as these examples suggest themselves, lead to a material being selected nore in conformity with the care and cost of design and workmanship.

A WORD TO THE APPRENTICE.

The apprentice of to-day if he wishes to be spared not a few vain regrets in after years, should take time to realize the advantages he enjoys over his predecessors of fifteen or twenty years ago. Then, even in large shops very few facilities were offered or were available to a lad for learning the technical side of his trade, with the consequence that his prospects for becoming anything beyond a skilled mechanic were more or less remote.

The care and attention bestowed on the apprentice today is such as to make some of us old timers a trifle jealous, and to wish that we had been favored with an equal opportunity. In spite, however, of all that is being done for them to-day, we fear a goodly number of apprentices are more or less unappreciative and do not take advantage of all the opportunities offered that they might. We know that quite a large number only keep themselves sufficiently efficient to scrape through the periodical examination which qualifies for increased wages.

Reference has been made to the fact that the older generations of us look jealously on the opportunities of the present. It is problematical, however, whether we would have availed ourselves much more so of these additional channels of knowledge than do the youth of today. Competition is keener, and a higher standard of competence is required, therefore while opportunities for the acquirement of a more thorough practical and technical training are increased, they are not in any sense superfluous. The percentage acquired of the total knowledge available, has been and still is low comparatively speaking, and while we would place no restriction on the recreations of the present day apprentice, we suggest his diligent application to and study of the problems of his profession, so that at a period of 5 or 10 years earlier in age than that of his predecessor of another generation, he may have the mature experience at least, of the latter.

TRADE CONVENTIONS AN AID TO PROGRESS.

Within the last few days, two important conventions have been held; those of the National Machine Tool Builders' Association at Atlantic City, and the American Foundrymen's Association and allied bodies at Pittsburg. The meetings of each are declared by competent judges to have been the most successful in every sense of the application of the word, of any previously held.

One feature that struck us, was the high quality and wide range of subjects discussed by the authors of papers, and the evidence of keen interest in them by the delegates present. At the Foundrymen's Convention an added attraction was the manufacturers' Exhibit, and we feel safe in saying, that never before in the history of the foundry, has such a visible, varied, valuable and magnificent operating display of foundry equipment been

brought to the notice of so large a representation of foundry and general engineering delegates.

The exhibit showed the wonderfully rapid progress that is being made in foundry engineering development, and goes a long way to eliminate the idea most of us have, that this department is not keeping pace with the others to which it is allied. This annual convention, or meeting place out in the open as it were, has done and is doing much to break down prejudice of the molder against the use of automatic machinery, and to convince the manufacturer that observation by others of his product does more to raise its standard than would the careful conservation by him of its supposedly valuable trade secret.

We are glad to be able to speak commendingly of convention work, effecting as it does much relief to those who bear the burden of bodily labor and increasing their earning capacity together with those who employ them.

It is one of the most efficient factors in cementing a pleasant relationship between employer and employe, meeting as they do on common ground and realizing in a way utterly impossible under ordinary work-a-day conditions, that each is necessary to the other and has a live personal regard for their mutual welfare.

EFFIENCY AND CONTENTMENT OF EMPLOYE.

In the business management section of the present issue is to be found an article "Profitable Ethics," from the pen of David Van Alstyne, vice-president, the Allis-Chalmers Co., Milwaukee. With the sentiments expressed, we are in general sympathy, yet we are disappointed to find no reference made to, or panacea prescribed for that large percentage of labor whose employment is more or less intermittent, and who are treated by large public corporations particularly, much in the same manner and with probably less concern as to consequences, than any of us treat the doffing or donning of some article of attire.

It is no uncommon experience to read in the daily press that some large corporation has discharged 500, 1,000 or 2,000 employes, part of a payroll of it may be, four or five times these numbers. With a majority, such is a frequently recurring incident of their existence, and being so, must necessarily militate against all organized efforts at high efficiency, no matter how skilfully applied and directed. Organized systems to secure results in efficiency will not and cannot bear effectively on these men. Pay them as high wages as you may, work them as hard as you can, and you will look for their contentment with a microscope, yet not find it. They do not realize that the main springs of the great corporation know them each personally through their work, and cannot do so because such knowledge does not actually exist in their case individually. Of the employes who constitute the payroll, irrespective of trade, weather or stock trading requirements, they form no part, and being sensible to their position, act and work accordingly. So long as men are taken on in great batches immediately some large contract is secured, and discharged again as soon as it is completed, just so long will inefficiency of performance have to be borne, and natural and righteous discontent be a serious factor of reckoning.

A man at his best must have an ambition, and in addition the opportunity for its exercise. The ambition is his inherently and instinctively, yet it may be and is stifled and killed outright by want of opportunity. The opportunity is the gift of the employer and will in its generous distribution be not wanting in generous returns. Corporations or individuals who in their desire to gobble up everything at sight, although the undertakings be far in excess of the numerical strength and equipment capacity of their organization the year round, supply the conditions of which we have spoken, and until some effective remedy which will either modify or obliterate altogether the possibility of any individual or body corporate doing so, moral responsibility of the employe, his efficiency, his self-respect and contentment, will maintain a standard far below that which our twentieth century progress and civilization calls for.

THE ATTRIBUTE OF LOYALTY.

It is generally admitted that the first and main consideration with the great majority of us, is to earn the most comfortable competence attainable from our labor. In doing this we may be more or less disloyal to ourselves and to those whom we serve. Naturally, the man who is disloyal to himself, cannot fail in exercising the like spirit to his superiors, yea even his equals and inferiors. We sometimes remark that a certain individual is foolish to his own best interests, yet we don't mean to imply the slightest suspicion of disloyalty. As a matter of fact his fault may be, that he is "a good fellow," and as such, no streak of the disloyal nature would be likely to exist. There is nothing deliberate in his foolishness, although its effects may be hurtful to himself and his employer. The disloyal man on the other hand, acts with studied deliberation, and looks for effects correspondingly. He is in the abstract, selfish, nursing a grouch born of a limited outlook, and is a decided acquisition in his absence, to any social function or to an employer's pay roll.

Loyalty is not a onesided affair, however, although in the relationship of master and servant, employer and employe, the disposition is rather inclined to consider it in this wise. We hear much of the loyalty or disloyalty of the employe, and little of either on the part of the employer. As subjects of the British Empire we need be no more loyal to it and its King, than he be to us and it. Correspondingly, there should be reciprocated loyalty between master and servant, and only in its full and free display by each, will the best results in efficiency be obtained and the highest remuneration be secured by both parties. Loyaly on the part of the employe need have nothing cringing in its get-up, should be outspoken in its demands when opportunity requires, and forbearing and appreciative under adverse circumstances. Loyalty on the part of the employer should consist in a lively personal interest in the employe's work and welfare, individually or collectively as conditions permit, and the careful consideration of requests and suggestions from that source.

There is a certain diffidence apparent in all lines of business, on the question of proffering a request to an employer for additional tangible recognition of service and which is due to neither more nor less than uncertainty as to how it will be taken. A suspicion exists that the employer will not be so loyal after refusing the request, and will take the first opportunity of rewarding what we opine was insolence shown and get rid of us altogether.

Such a conclusion is unfortunately a very natural one, and we concentrate our efforts to forestall his intent and get even with him. Our loyalty has vanished, with or without justification, and the training of years has been sacrificed. An old saying, "that there are good and bad of every sort" seems to us peculiarly applicable to this feature of loyalty to which we have referred, and our experience has been, over a goodly number of years and a fair sprinkling of individual employers, that even after a request refused they are still to be trusted.

POWER EQUIPMENT & APPLICATION

Expert Descriptive Articles Dealing with Selection and Purchase of Most Suitable Power Equipment for All Purposes, its Proper Application, Installation, Operation and Treatment.

DOUBLE HELICAL GEARING.

Double helical gears have been [illegible] for some years with cast teeth and extensively adopted for certain classes of heavy work where, although it is [illegible] consideration, but owing to the practical difficulties of making them with machine cut teeth they had been superseded for high-speed work by [illegible] gears with straight teeth. During the last few years, however, the cutting of double helical teeth has been considerably developed, and they are now produced with the same facility as straight-toothed gears.

When correctly designed and accurately cut double helical gearing possesses advantages both in principle and utility [illegible] from any other type. The advantages may be briefly summarized as follows: 1. Continuity of engagement, which eliminates vibration and enables a greater load to be transmitted. 2. Pinions with a small number of teeth (say 4 or 5) can be used, and in this way high ratios can be obtained without using a wheel of abnormal diameter. 3. A higher efficiency than in the case of straight-toothed gearing is obtained, particularly when the number of teeth in the pinion is small, due to the direct action of the teeth during engagement. In straight gears the line of contact are parallel to the axis of rotation, consequently the phases of engagement are constantly changing, and the action is uneven. With double helical gearing the line of contact is a curve extending diagonally across the tooth, and all phases of engagement occur continuously. A silent running at high speed is obtained, owing to the gradual engagement and absence of vibration. There is no necessity for using soft pinion pinions, such as rawhide or [illegible]

Suitable Materials

As regards suitable materials it is generally found that a [illegible] pinion working with a [illegible] gives the best results. In [illegible] where [illegible] must be reduced, pinions made from [illegible] nickel steel, working with cast iron wheels, can be advantageously used. There are two systems of cutting double helical wheels from solid blanks. One requires the use of end mills made to correspond to the space to be cut, and the other is a generating process. In both cases similar to those used for cutting straight wheels are used. In the former case the end mill cuts both the right and left hand portions of the teeth. The mechanism in the machine for giving the lead to the blank has therefore to be reversed when the tool reaches the centre.

The use of end mills for this work entails some disadvantages, as these tools cut slowly and wear out quickly. Besides this, when reversing at the centre a radius is left by the tool at the place where the blank leaves the cutter when changing its direction of rotation. This radius should theoretically be a sharp corner, and unless some compromise is effected, it fouls the point or apex of the tooth which is intended to gear with it. As a consequence the point of the tooth must be chipped or filed off by hand, otherwise the radius must be recessed by a special tool in a separate operation, after the cutting of the teeth has been completed.

Generating System

The generating system by means of hobs is a continuous process. Two hobs are used, one right-hand and one left-hand thread; these respectively cut the right and left hand portions of the teeth. The shape of the hob threads is made to correspond to a rack tooth, and they are both geared with the blank so as to give the correct ratio for the number of teeth to be cut. The machine has also a special mechanism to give the requisite lead to the blank for the desired helix.

Gears made by this system have the teeth staggered—i.e., the tooth on one side is opposite the space on the other. This has a similar effect to halving the pitch, and is in this way conducive to smooth working with a small spiral angle. A further advantage in this system is the continuous rotation of both the cutting tool and the blank, which prevents backlash in the machine having a deleterious effect. No intermittent dividing mechanism is used, and therefore there is no risk of inaccuracies in spacing, which are sometimes experienced with other processes.

The spiral angle should be as small as is consistent with the attainment of continuous engagement. In determining this angle the proportion of the face width to the pitch must be taken into consideration. It is therefore usual to adopt a certain spiral angle as a standard and to make the face width a fixed projection of the pitch. The angles usually adopted are 45 degrees and 23 degrees, with a face width of three and six times the pitch respectively. A large angle is generally considered to be a disadvantage, because when running under heavy pressure wedge action occurs between the teeth in contact, causing friction and decreased efficiency. It is therefore advisable to use a small angle and a comparatively wide face width.

The following particulars and formulae are applicable to double helical gears cut by the generating process, with a spiral angle of 23 degrees and a face width six times the pitch, for ratios up to 6 to 1, afterwards increasing with ratio.

Let p=pitch in inches; P=tooth pressure in pounds at the pitch line; W=width of face in inches; V=pitch line velocity in feet per minute; r=ratio of reduction; K=permissible stress.

Then

$$P=\frac{\text{B.H.P.}\times 33{,}000}{V}=\frac{pWK}{2}$$

For ratios up to 6 to 1, $p=\sqrt{\frac{P}{3\times K}}$

For ratios between 6 and 10 to 1, W=rp (r=ratio to one).

$$p=\sqrt{\frac{2.5P}{rk}}$$

Proportions of teeth:—

$$\text{Thickness of tooth}=\frac{P}{2}$$

$$\text{Addendum}=\frac{0.89\times P}{3.14}$$

$$\text{Dedendum}=\frac{1.05\times P}{3.14}$$

For ratios above 10 to 1 special treatment is advisable, and no fixed rules can be laid down. Each drive should be considered with regard to the general conditions.—Mechanical World.

PRODUCING IRON BY ELECTRICITY

On Nov. 15, 1910, the Swedish Government commenced operations in the experimental production of pig iron by electricity on a scale sufficiently large to be considered of commercial magnitude and to approximate closely the conditions of actual commercial manufacture. Without good coal, and facing a rapid diminution in the supply of wood available for charcoal, the Swedish iron industry has felt that its salvation lies in smelting with the cheap electric energy developed from the country's abundant water-power.

A contract was entered into with the directorate of the water-power at Trollhatten to take 3,000 horse-power per annum for three years at $2,680 per year, and this contract was guaranteed by the Crown: The installation is designed to produce about 20 tons of pig iron every 24 hours, or, with continuous operation, 7,300 tons per annum. About 30 men are employed. The utmost secrecy prevails regarding the operations, and no official news of the results is expected for some months. The local press, however, has stated that the operations of the experimental plants have completely fulfilled all expectations and have proved that ore can be electrically reduced with a saving of two-thirds of the coal used in the old-style blast furnaces.

There seems to be a feeling among iron manufacturers that the experiments are proving the practicability of the process, and it is reported that other furnaces are being planned. It is hoped that by the end of 1911 there will be at least four electrical blast furnaces in operation, producing at the rate of 30,000 to 35,000 tons of pig iron per year on a consumption of 12,000 electrical horse-power.

It is reported that tests have been made of the Trollhatten electric pig iron at a mill in Lotrop. Those tests proved that the wire intended for wire rope is of specially even and good quality.

Correspondence

Comments on articles appearing in Canadian Machinery will be cheerfully welcomed, and letters containing useful ideas will be paid for.

Information regarding manufacturers of various lines, with their addresses will be supplied either through these columns or by letter, on request. Address letters to Canadian Machinery, 143-149 University Ave., Toronto.—Editor.

* * *

J. W. H., Wilberforce, Ont., asks information regarding books on running steam drills, also sharpening and tempering drills for hard rock work.

* * *

Use of Common Salt.

In answer to questions on page 107 of the April issue of Canadian Machinery I submit the following :—

(1) The proper method for melting common salt for heating tools or cast steel, is to fuse it in a cast iron crucible bricked in a furnace ; the operation being as follows :—Cover the bottom of the crucible about one-third inch deep with soda solidly rammed down, and fill this crucible up to the edge with common salt ; then heat until fusion is complete. Now add gradually to the melt, enough common salt to fill the crucible, and then add about 5 per cent. by volume of saltpetre and 10 to 15 per cent. of potassium chromate.

Yellow prussiate of potash in small pieces is added to the melt as required, a larger quantity of it being used if the cementing effect is to be increased. In using the yellow prussiate of potash it must be borne in mind that the vapors evolved are very poisonous and should be removed by a pipe.

(2) By the addition of a small quantity of readily fusible soda (carbonate of soda) and a small quantity of saltpetre the fluidity of the melted mass is increased.

(3) Common salt will become a fluid at about 778 degs. by the use of carbonate of soda and a small quantity of saltpetre, it will become fluid at a much lower temperature.

(4) I would advise the use of common salt.—I. S. Barkey.

Societies and Personal

W. E. Siler, shop engineer, C. N. R., Winnipeg, has taken a position as superintendent at the Canadian Fairbanks Co. plant, Farnham, Quebec.

* * *

Arnold M. Bennett, chief chemist, the Montreal Steel Works, Ltd., has been appointed works manager with Catton & Co. Yorkshire Steel Foundry, Leeds, England, and sails by steamer "Megantic" on 8th July from Montreal. Mr. Bennett has been with the Montreal Steel Works since Nov. 1905, and previously held the position of chief chemist with Samuel Osborn & Co., Sheffield, England, for seven years.

* * *

A complimentary banquet was tendered Mr. John McClary, London's greatest captain of industry, at the Tecumseh House recently, by the Board of Trade. Over one hundred of the business and professional men of the city were present to honor the guest. An illuminated address was presented to Mr. McClary. Short speeches of congratulation were made by President Reason, Sir George Gibbons and Mayor Beattie.

Dr. Reason presided, and he tendered Mr. McClary the congratulations of the Board of Trade.

* * *

It is announced that the annual convention of the Canadian Electrical Association will take place this year at Niagara Falls, Ont., on the 21st, 22nd and 23rd of June. It was the original intention of the managing committee to hold the convention in Winnipeg, but it is felt that it would be better to postpone the holding of such a gathering in that city until the association becomes better organized in the West. The last convention at Niagara Falls was in 1906. Then some of the great power plants were only in progress of construction. Visitors will now be able to see them under different conditions. Mr. W. L. Adams, of the Ontario Power Company, Niagara Falls, has been appointed chairman of the committee of arrangements, and Mr. W. A. Martin, assistant general manager of the Toronto Electric Light Company, chairman of the papers committee.

* * *

The ninth semi-annual convention of the National Machine Tool Builders' Association, held at Atlantic City, N. J., Thursday and Friday, May 18 and 19, was a notable meeting, the papers and discussions being of exceptional value to those in the machine tool making industry. It was the eighteenth convention the organization has held. An indication of its success is contained in the remarks of Murray Shipley, Lodge & Shipley Machine Tool Company, Cincinnati, who at the end of the third session, in proposing a rising vote of thanks to the speakers, remarked : "This convention is the most successful the association has ever held, inasmuch as the papers presented and their discussion have brought us particularly close to the great problems in our business." There were about 150 members and visitors in attendance at the meeting, and remarkably few of them neglected any of the sessions. A large measure of the success of the meeting was due to the very efficient manner in which President F. A. Geier conducted the programme, with the able assistance of secretary C. E. Hildreth.

Gossip of the Trade.

The Canadian Fairbanks Co. has been awarded the contract for the largest automatic grain-weighing scales yet built, by the Montreal Harbor Commissioners for their new two million bushel elevator, No. 2. Fourteen automatic weighers make up the contract, and installation is required before the opening of navigation in the spring of 1912. The new installation will require the services of one man only in attendance.

* * *

The John Inglis Co., Strachan Ave., Toronto, are negotiating the purchase of a piece of land adjacent to their works, on which to erect a large and up-to-date grey iron foundry. With this additional departmental capacity, their plant will be more able to cope with the increasing demand for heavy machinery manufacture, and rapid and economical production.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

PROFITABLE ETHICS.

David Van Alstyne **

Business is war and money-making is and always has been the chief motive of all efforts at progress. In the present organization of society it is inevitable that money-getting shall be primarily our inspiration, and indeed it is doubtful if any other motive will ever be practicable, despite the Utopian program of the socialists who are looking forward to the time when the love of achievement will be our inspiration and the getting of money unnecessary. On the other hand, unrestricted money-making like any other dissipation overdone, is not good for the health of the body politic. The chief manifestation of the disease is in the extremes of wealth and poverty; the former of which is unnecessary, and the latter ethically and therefore morally wrong. Because poverty is wrong it will not be permitted to continue always.

Potent Factors of Progress.

Among the factors of progress in our social organization, perhaps the most potent are the employers of labor, the managers of men. The power of the church, of sociologists and philanthropists to bring about needed reform is insignificant in comparison with that of employers. The social reformer, who would effect his reforms through the employer, is confronted with the task of increasing the employes' wages and at the same time increasing the employer's profits. It is the instinctive desire of every employer to promote the welfare of his employes to the fullest possible extent as long as it does not interfere with his profits. His philanthropy and cost will go not extend much beyond this. Maximum output, lowest cost of production and highest wages can be accomplished through accurate knowledge of what every detail of the business actually is, the investigation of what it should be, and the bringing of the actual up to the standard and keeping it there in proportion to the increase in magnitude of the business the importance of the personality of the leader decreases, but the system and organization through which he exercises his personality, increases. It is through a systematic control of employes of the rank and file that the relative waste of time and material, rather than through the personal influence over his immediate subordinates. The measure of the efficiency of an organization is the extent to which the enthusiasm of the individuals in it is maintained through the organization and not through the personalty of the man at the head of it.

Of promoters or captains of industry whose far-sightedness indicates where development is needed and where money can be made, there is no lack; but managers who will patiently standarize each detail in the operation of their business and get the maximum out of it, are exceedingly scarce. Under detail-control management, as little as possible is left to individual judgment, but the movements of every man, every piece of material, and the expenditure of every dollar are guided according to a prearranged schedule. Not the least asset created by the management which has accurate record of the individual, is the impression made upon the employe that the highest officials know of him personally; that he is less subject to the whims and prejudices of his immediate superior and that he is recognized as an essential part of the organization, which arouses an enthusiasm that connot be too highly valued.

Employer and Trade Unionism.

Management through control of details takes advantage of the fact that few men know how to work efficiently and few employers know definitely what they should expect of their employes or their money otherwise expended. Men do not object to hard work if they are well paid and contented, and the harder they work within reasonable limits, the more contented they are. Whenever the employer can create the feeling that the sole object of his official existence is to get the most out of his employes for the money invested in them, and that he realizes this can be done only with the best paid, most thoroughly contented employes, he has won his point and need waste no further effort to destroy Unionism. He will find that he has accomplished all that is necessary or desirable in modifying radical Unionism and that it is as much appreciated by employes as employers.

Assuming that detail-control will produce and maintain maximum output, best quality, lowest cost, higher wages and contented employes, and that as a consequence, it meets with the approval and support of employers, what results may we not be justified in looking for toward an amelioration of some of the social evils which exist to-day, chief of which is the extremes of wealth and poverty? It is true that when all concerns in the same business are equally well managed, no one of them will have an advantage and the same competitive conditions will exist as before; but the next step forward will be from a higher plane.

Is it not safe to conclude that those employers who have had the experience and the profit, will be convinced that the most ethically conducted business is the most profitable, and will it not be a definite and concrete way of getting into practical use those theoretical ideals so attentively listened to on Sundays, but so regularly forgotten on week days? Every man who is willing to work is entitled to a living, and no man is entitled to so much, that somebody else must go hungry.

HANDLING MATERIALS AND MACHINERY.

In spite of the many and strenuous efforts which are made, from time to time, to systematize manufacturing establishments and to reduce the cost of production, it is almost impossible to go in the average shops without being impressed with the opportunities for reducing the cost of handling material to a considerable extent.

Work from the screw machine will be tossed promiscuously into barrels or boxes, so that it must be handled many times between the start and finish of its journey through the shop. Larger work is piled on the shop floor and must be moved from here to other departments either by hand or by being loaded on trucks and again unloaded at the other end.

Heavy machines are moved from place to place by rollers under the skids, coupled with a liberal use of crowbars and profanity. This is particularly true of machinery salesrooms, many of which sell cranes and conveying machinery. The cost of loading and unloading machines from drays in the usual way is a much larger item than we might be willing to believe if we looked into the matter carefully.

Some shops where this has been considered to some extent, make it a point to have the product of any machine placed directly on a substantial shop truck so that it can go to the next department without further handling or delay. This is done either in boxes or in racks, according to the nature of the work, but in either case there is a distinct gain in time over the other method. There is also likely to be much

* Abstract of paper presented before the Congress of Engineering at the Fifth Anniversary of the dedicating of the Chapter of the Massachusetts Institute of Technology.

** Vice President, Allis Chalmers Co., Milwaukee, Wis.

less damage to the work itself, and, besides reducing the actual handling cost, it avoids delay between departments which is not only exasperating but also expensive.—American Machinist.

AN OBJECT LESSON IN EFFICIENCY.*

Reporting the working out of one of the most notable examples in this country of "Scientific Management" according to the "Taylor system," Wilfrid Lewis, president of the Tabor Mfg. Co. of Philadelphia, described the state of his company "before and after," and gave many details of the transition from failure to success. Mr. Lewis in describing his entrance into the Tabor Company eleven years ago, said: "I was advised by my well-wishers to keep an open shop and keep down the number of clerks or non-producers. Success I was told depended upon the ratio of producers to non-producers in any well managed concern. Draftsmen were recognized as a necessary evil, the fewer of them the better, and one good superintendent to lay out the work and keep it moving through the shop, was considered quite enough. In fact, to the casual observer, we had hardly enough work to keep a good man busy and we did not appreciate the need of better shop management until our growing business began to show increasing losses. Before we were aware of any dissatisfaction and within a year of the opening of our shop, we were surprised by a general strike for higher wages and shorter hours. Our unguardedness or lack of management had encouraged our men to combine against us and make unreasonable demands. We were then paying them more than they earned and they insisted upon having still more, which simply meant ruin to the company in a short time. Our strike was compromised by the concession of shorter hours at the same pay, the men agreeing to turn out the same amount of work per day. There was no difficulty about their doing this, and for a time I believe they kept their promise, but a day's work was then with us as it is now with nearly the whole world of industry, a variable and indefinite result for a given expenditure of time or money. We had no standard by which a proper day's work could be fixed except the very shaky and misleading one of the best that had been done before, and having as we were now well aware, an organized resistance against any increase in out-put or efficiency to meet, the outlook for the company was not encouraging. At the same time we knew that machines had been built by others for less than they were costing us, and we felt confident that a way could be found out of our difficulties.

The firm took up the Taylor system; the launching of the new order being immediately in the hands of Barth, one of Taylor's assistants at Bethlehem. The directors of the company soon split over the issue, and the anti-Taylor members finally solved part of the problem by withdrawing from the company. Mr. Barth was obliged, as he proceeded in his work, to call for more and more assistance and as new men were added to our planning department, the cost of the new system began to draw so heavily upon our resources that for a year or two we seemed to be actually losing ground, and we certainly would have been obliged to suspend but for the grit and determination of Dr. Taylor, who had the courage of his convictions and carried us through the storm, which culminated in the resignation and withdrawal of the opposing forces.

From this time forward conditions began to improve, and the work begun by Barth and continued by Hathaway, who is now vice-president of our company, began to bear fruit. It was not long before we ceased to lose money, broke even and began to gain. A better spirit prevailed, better wages were earned, and production increased so rapidly that I was lost in astonishment at the potency of the engine gratuitously placed in my hands through the good offices of my life-long friend. We had in effect been installing at great expense a new and wonderful means for increasing the efficiency of labor, in the benefits of which the workman himself shared, and we have to-day an organization second I believe to none in its loyalty, efficiency and steadfastness of purpose.

In 1910 The Tabor Mfg. Co. turned out 2½ times as much value in finished product as it ever did under the old regime with the same force. Formerly for every ten men engaged as producers or "chipmakers," as Dodge defines them, we had not more than one man connected with the shop as a non-producer. Now we have fewer men at machines with three times as many non-producers turning out practically three times as much work, because prices are lower to-day than they were five or six years ago, and 2½ times the value means about three times the product.

We pay better wages for fuller and better results performed in a definite way, and yet there is no driving in the ordinary sense of the word. The tasks assigned to the workmen are easily within their ability to perform, and when new work is given out as occasionally happens at day rates, before the time on the job has been set, nobody wants to take it because there is no bonus attached for its quick and accurate performance.

*Presented before the Congress of Technology at the Fiftieth Anniversary of the Granting of the Charter of the Massachusetts Institute of Technology.

HOW TO SAVE $1,000,000.

The part "little things" play in the operation of a great railroad is well brought out in a circular recently issued to the employes of a large railroad system. The circular states: "You are one of about 50,000 employes. Can you save 5 cents a day for the company? That is only $1.50 a month. A few spikes, bolts, etc., saved, or material not replaced until full use has been obtained, will turn the trick for track men. Train and yard crews watching every move and not wasting their time will do their share. Enginemen can easily use a few less shovefuls of coal and make a better showing. Station and telegraph employes by being prompt on the wires, and careful handling of freight will save delay to trains and reduce claims. Office men can reduce unnecessary wires and correspondence, save stationery and postage. Shop men have many ways of saving time and materials. Everyone can help and some can help others. A small saving by each employe spells prosperity. Prosperity hires more men and pays better wages than hard times."

THE GENERAL SUPPLY CO., OF CANADA, LIMITED.

The General Supply Co., of Canada, 115 to 125 Adelaide street west, Toronto, with head office at Ottawa, Ont., and western branch at Winnipeg, Man., is making rapid progress in the extension and increase of its business among the large and small manufacturing corporations and companies throughout the Dominion.

Mr. C. R. Medland, Toronto branch manager, informed our representative that since opening up at the beginning of the year, their sales have exceeded the highest expectations. Their staff has grown from two to twelve, and not the least important addition has been that of A. E. Juhler, late sales representative of London Machine Tool Co. Mr. Juhler takes care of the machine tool sales, and his former experience in this direction makes him a valuable acquisition. Mr. T. C. MacDonald looks after the smaller supplies, and he, too, is a thoroughly experienced man in this department.

No expense has been spared in securing the most competent men to manage the various departments, and every care has been taken in the selection of a full and reliable line of engineers' and general manufacturers' supplies. In addition to a steady demand for moderate daily quantities, Mr. Medland reports contracts for installations of the complete equipment for various new mills and factories.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

LIGHT ELBOW PIPES — GREEN SAND CORES.

By John H. Eastham.

Light elbow and other connections for heating apparatus or similar purposes can be made a paying line where a steady sale is possible, by a small initial outlay on patterns and rigging. Well-fitted iron boxes are advisable, with a minimum of play in pins.

Patterns should be made in halves, and of metal, with short dowel pins to avoid twisted castings. A good open grade of sand is essential to release vents from cores easily and prevent risk of loss through blown castings.

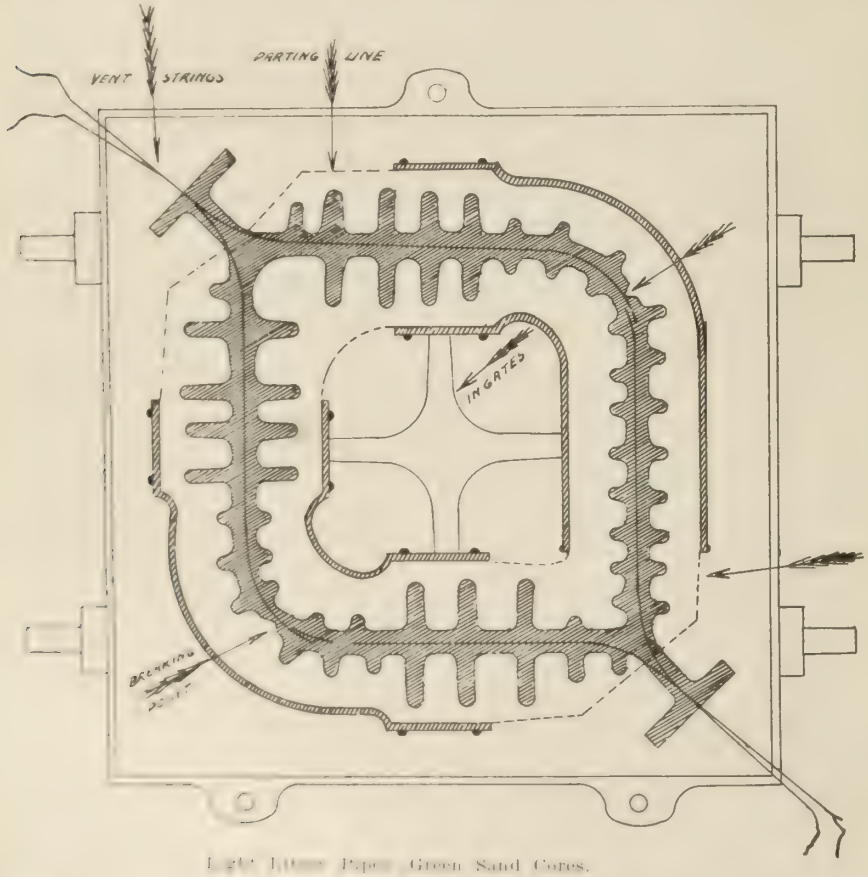
On a good flat turnover board, lay core bar with prods upwards; cover this with bottom halves of patterns, ram up stiff and turn over a solid way. Cut out bottom joint from ends of patterns to shape of core bar allowing a little rounding ready, and line up with wet parting sand in level of box edge. Lay a little sand in patterns and place core bar, (dry sanded) into position. Tap or rub core bar down as low as possible. To secure clean lift when removing cope, and tap up to pull pins.

Place vent strings as shown in sketch; slightly damp top halves of patterns, ram them hard full of sand, strickle off level, cut out ridges for vents, and turn them over smartly on to bottom halves. Make joint sloping up to ends of patterns, and wet parting sand up to top.

To ensure clean lift, ram up cope and lift off with one screw in each pattern to remove them from core at same time. Cut away clear, T handles on core bar and take out core, placing it on soft sand bed or on two weights in the case of larger size pipes.

When pipes exceed $\frac{1}{2}$-inch in thickness, a few shavings burnt under core to skin dry it a little is beneficial; but if a good sized vent is used, this is not absolutely necessary. Draw bottom halves of patterns, and cut runners as shown in sketch, no risers being required. Little or no finishing should be needed. Dust a little charcoal blacking on mold, put core back into place, and close.

Hot iron and clean skimming are essential to obtain good results, and a percentage of 1 part coal dust to 7 parts sand in cores, will assist air to escape and also give smooth surface to inside of pipes. When shaking out, a few taps will clear core and core bar from castings; a single blow being sufficient to break core iron, owing to weak place shown at bend of elbow. By this system castings are obtained true to pattern, and cost of fettling considerably reduced. With a little practice a boy of 17 years will turn out a surprising quantity per day. When box bars follow patterns, no gaggers or soldiers are needed; the main points to remember being, not to work sand too damp, and to employ a good open vent in every instance.



Light Elbow Pipes, Green Sand Cores.

HARDENING AND MIXTURE FOR CAST IRON.

By William Barrow, Montreal.

The usual method of hardening a small quantity of iron is to sift powdered ferro-manganese into it as it comes from the cupola spout. The hardening effect is not great, but it gives a closer grain to the iron. To ensure a harder mixture, 10 to 25 per cent. of car wheel scrap should be added to the charge in the cupola. A small quantity of sulphur in the ladle produces white iron, but usually too hard for most purposes. If you find that silicon is high in your mixture, try one part sulphur to 45 parts iron. The result will be a hard but by no means white iron. Most foundrymen have a dislike to the use of sulphur, but under the above conditions it will prove beneficial. It may be noted that cast iron should contain few impurities, especially free carbon which interrupts the crystalline continuity of its structure.

Strength of Cast Iron.

Generally speaking, cast iron has an ultimate tensile strength of 18,000 to 21,000 pounds per sq. inch., and is not losing so much ground as people think, because it is possible for a foundry to turn out an iron having a tensile strength of 34,000 to 35,000 pounds per sq. inch with a density of 7.28. This goes to show that the material is capable of competing with steel in many ways. The mistake most often made when high quality castings are required, is that of mixing high and low silicon irons. For strength and durability, the silicon and carbon should be both as low as possible; the hardness being taken care of by mixture of sulphur, manganese and phosphorus. Occasion arises to say, why cannot silicon be used to give fluidity, if silicon is the key to success in producing this robust material?

We reply that the fluidity caused by silicon is only great while it lasts, being narrow in range and rapid in solidification.

To obtain good grade castings then, the iron should be low both in silicon and carbon, but have a fair measure of manganese and phosphorus. Sulphur may be of higher percentage than the general limit allowed by the analyst. Highly satisfactory results are obtained from the following :

Bearcliffe Pig ... ...22 per cent.
Cold Blast ... ...27 per cent.
Selected Gray Scrap .....23 per cent.
Frodair Pig ....28 per cent.

The above irons are all melted in Europe. Bearcliffe is a rather tough iron of good class Hematite and carries about 1 per cent. of silicon, about the same of carbon and is low in phosphorus, sulphur and manganese. Frodair is a dark iron carrying low silicon and extra low carbon, but melting hot and fluid by reason of a fairly high percentage of manganese and phosphorus Its sulphur ranges from 0.08 to 0.10 The scrap iron was not analysed but was judged to be low in silicon and carbon, and medium in phosphorus and manganese.

In the mixture, 28 per cent Frodair has been taken to make sure of the head and fluidity of metal. As a really low carbon basis for a specification, 22 per cent. Bearcliffe will keep phosphorus within safe limits and ensure fluidity with its manganese. Cold blast is added to return carbon which has been lowered by Bearcliffe. It also serves to keep sulphur within safe limits, and guards against extreme hardness. The two latter secure strength and toughness in the mixture. It will be noted that all have about equual silicon, consequently it will be seen that for many purposes, cast iron will answer for steel. The all important point is to have a rapid and hot melt.

Cupola Blast.

Many foundries suffer from insufficient blast, and thereby fail to obtain scheduled capacity. This is a fault capable of being remedied. Allow 33,000 cubic feet of air for every ton of metal melted, and figure the quantity of air per minute the fan should deliver in proportion to the limited capacity of the cupola ; then install a fan that will produce and convey easily this amount of blast to the furnace, taking care that wind box and tuyeres are of sufficient area. A pressure gauge should be placed on the wind pipe where it joins the fan casing, to determine the amount of air being delivered. A certain amount of loss will result from friction in the pipes and attachments.

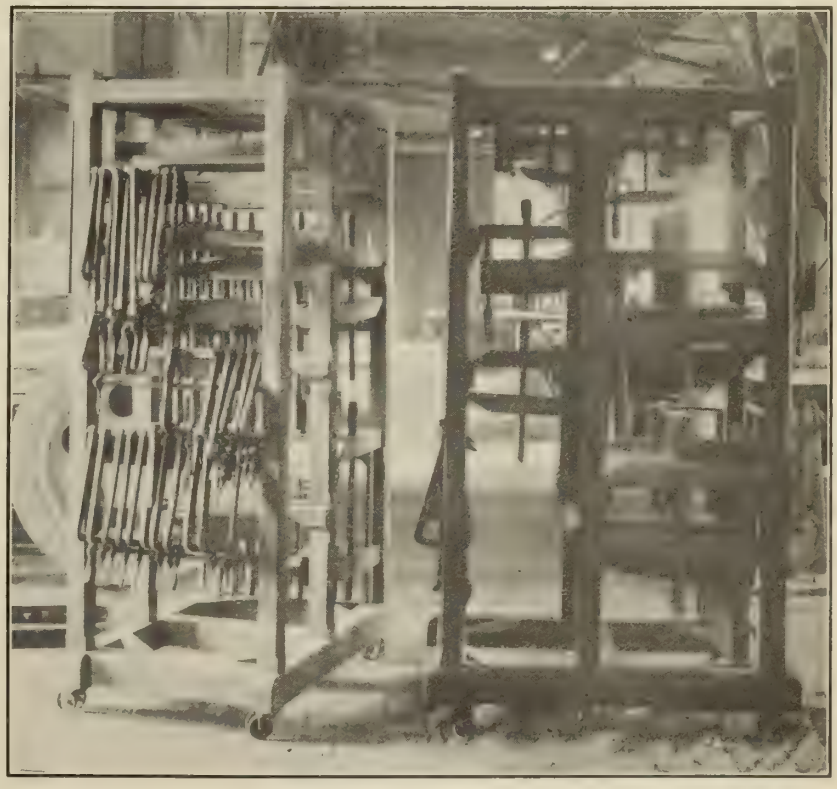
Better results in density and strength will be got when the iron is cast hot, as the greater the fluidity the more complete will be the escape of gases. Again the hotter the poured iron, the more rapid the cooling process ; because the temperature will vary over a wider range in a given time.

PATTERNMAKER'S HANDSCREW RACK.

By H. J. McCaslin.

A common sight in pattern shops is to see hand screws on the wall, on and under the benches, on the floor, and, in fact, everywhere there happens a corner to throw them. Every patternmaker knows that unless a place is provided, handscrews have a peculiar way of getting mixed up with everything else.

Herewith is shown two racks that have been in use for some years. With two of them placed near each end of the shop, and with strict orders that all clamps must be returned to place immediately upon their removal from work, very little of the aforementioned trouble was experienced. A great deal of the pattermakers' time was saved for they knew where to look for the clamps when they were required for a job.



Patternmakers' Handscrew Rack.

The racks were mounted upon casters and can therefore be rolled to any part of the shop. This was found to be a convenient feature when glueing up large stock, or glueing up segmental work upon the face plate when clamps are required at intervals. It will be seen that the central part of the rack is designed to receive various size wood clamps, while each end is fitted with a bar for iron clamps.

NEED OF VENTILATION FOR BRASS FOUNDRIES.

A commission on occupational diseases appointed by the Illinois legislature, made a comprehensive report in January. Its investigations covered lead poisoning, brass poisoning, carbon monoxide poisoning, the effect of compressed and so-called work poisons in general. In the brass trade, the workman may be poisoned by fumes, but these are controllable ; and the finding of the studies in this detail is that brass founders' ague is preventable. The poorer varieties of brass have of course a large proportion of zinc. Brass founders' ague, it is believed, is caused by the sublimation products of zinc, and therefore the foundries making the cheaper grades are more dangerous to work in than those making better grades. In large foundries with good ventilation, either natural or artificial, brass chills are practically never seen. As for actual conditions in Chicago, only 4 of the 89 foundries visited could be classed as well equipped and free from trade sickness ; 63 were acknowledged as the centres of trade sickness ; 7 more were suspected of being equally bad.

A physical examination of 187 men, representing 78 foundries, showed that 146 complained of some trade sickness, 15 of brass chills. As brass founders handle lead, arsenic, antimony, phosphorus, and the cyanides, chills are not the only form of illness to which they are subject.

Foundrymen's Convention and Exhibit at Pittsburg

Whether Looked at from a Fraternal, Educational or Business Point of View, the Convention and Exhibit of the American Foundrymen's Association and Allied Bodies Must Rank as the Most Largely Attended, Most Extensively Progressive in its Scope, and Most Successful in its Conduct and Results, of the Many Previously Held.

THE sixteenth annual convention of the American Foundrymens' Association, its allied bodies the American Brass Founders' Association, the Associated Foundry Foremen and Exhibitors' Association was held in the Pittsburgh Exposition Buildings from May 23rd to 26th inclusive. On account of the meetings of the American Society of Mechanical Engineers following immediately thereafter, the exhibit remained open and in operation until June first.

At no previous meeting was such a wide range of machinery exhibited as at this, and a most gratifying feature of the exhibits this year is that practically all of them were installed and in operation when the doors were opened. A very large number of moulding machines were shown, and as indicative of the development in this direction, there was an increased number and variety of jolt ramming machines on exhibition. One new type, attracting much attention, was electrically driven. Core making machines of various kinds, were also plentiful.

The professional sessions opened in the auditorium of the Exposition buildings, Major J. T. Speer presiding. Cordial addresses of welcome were given by representatives of the city of Pittsburg and the chamber of commerce, to which as cordial a response was made by A. D Howard, vice-president of the American Foundrymen's Association. Major Speer in his brief annual address, pointed out that great strides had been made in the past few years in the science and art of founding as a result of co-operation and interchange of ideas among foundrymen. He also commented on the prevailing unsatisfactory business conditions, but expressed firm belief in an early return of good times.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, in his annual report, said that for the first time in the history of the organization, the transactions have been sent to members hip in bound form. He said that much progress has been made in the development of the permanent mold and in continuous melting practice. His report showed a total membership of 692 and a balance in the treasury of $1,541.95.

N. K. B. Patch in his report as president of the American Brass Founders' Association laid emphasis on the fact that the appointment of an official chemist had been made by them, and that satisfactory results and returns might be confidently looked for in the future. The report of Secretary Corse showed a gain in membership, which now amounts to 287, and a cash balance of $94.88 after disbursements during the year of $1,386.59.

Regret was expressed at having to record the recent deaths of two prominent members of the Exhibitors' Association, in the persons of W. W. Sly, president of the W. W. Sly Mfg. Co., Cleveland, O., and A. N. Spencer, vice-president of the Olivery Machinery Co., Grand Rapids, Mich., both of whom had made arrangements to attend the convention this year as usual. Resolutions of condolence were ordered to be drafted, for sending to the bereaved families and for entry in the minutes of the association.

The reading of papers enumerated in our previous issue and to be published in more or less detail in future issues of Canadian Machinery and Canadian Foundryman, formed an interesting and important feature of each day's proceedings of the various associations. In this connection it is worthy of note that those engaged in steel foundry work, had



Exposition Buildings, Pittsburg. American Foundrymen's and Exhibitors' Association Convention.

for the first time a session devoted entirely to that particular department.

Among the works' visits arranged and fully taken advantage of by the delegates were those of the Westinghouse Air Brake Co., the Homestead Steel Works and the Maesta Machine Co. The recreative, amusement and social side of the convention was provided for in the big league ball game between Pittsburg and Cincinnati ball teams, the vaudeville entertainment given by the Exhibitors' Association, the dinner given the Associated Foundry Foremen by the Pittsburg Foundry Foremen's Association, and the open subscription dinner given at the Fort Pitt Hotel.

While much attention was paid to the requirements of the male delegates, the ladies attending were in no way neglected. In addition to their presence at the vaudeville entertainment, an automobile ride with dinner at the Country Club, and visits to the Carnegie Institute, Margaret Morrison (Carnegie) School and Phipps Conservatory, formed part of their programme.

A gratifying feature was the large and representative body of delegates from Canada, bent on the idea of keeping posted in the latest developments of the foundry field, and who have carried back to their respective shops and put into effect, the good things seen and noted. Among those Canadian foundrymen present we noticed:—J. A. Agnew, Standard Sanitary Mfg. Co., Toronto, Ont.; G. T. Baguley, Dominion Stove Foundry Co., Toronto, Ont.; T. B. Bennett, D. E. Maxwell & Sons, St. Mary's, Ont.; Peter Bain, Canadian Foundryman, Toronto, Ont.; S. L. Chapman, Ont. Wind Engine & Pump Co., Toronto Ont.; S. B. Chadsey, Massey-Harris Co., Toronto, Ont.; H. W. Donald, Standard Sanitary Mfg. Co., Toronto, Ont.; J. H. Fryer, Galt Malleable Iron Company, Galt, Ont.; H. Goodes, John Inglis Co., Toronto, Ont.; H. L. Gulline, Warden King Co., Montreal, Que.; B. Geary Co., American Abell Co., Toronto, Ont.; W. R. Glasgow, Canadian Steel Foundries, Welland, Ont.; H. Hertfelder, Dodge Mfg. Co., Toronto, Ont.; A. R. Hockin, Taylor-Forbes, Guelph, Ont.; W. G. Harris, Canada Metal Co., Ltd., Toronto, Ont.; H. V. Hamilton, The Steel Co. of Canada, Hamilton, Ont.; Thos Jenkins. Dodge Mfg. Co., Toronto, Ont.; W. A. Jackson, Steel & Radiator Co., Ltd., Toronto, Ont.; Matt. Kennedy, Jr., Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.; M. Kelly, Western Foundry Co., Wingham, Ont.; H. O. Kerr, Kerr Engine Co., Ltd., Walkerville, Ont.; A. Knight, Canadian Northern R.R., Winnipeg, Man.; P. Michael, The Dominion Radiator Co., Toronto, Canada; R. R. Mitchell, The Robert Mitchell Co. Ltd., Montreal, Canada; J. K. Moffat, The Moffat Stove Co., Weston, Ont.; J. R. Meadowcroft, The Garth Co., Montreal, Canada; A. C. Morris, Ontario Wind Engine & Pump Co., Toronto, Canada; J. McLaren, Findley Bros., Carleton Place, Ont.; A. J. Oliver, The R. McDougal Co., Galt Canada; J. R. Phillips, Pease Foundry Co., New Toronto, Ontario; Chas. B. Phinn, Canadian Westinghouse, Canada; J. R. Porter, Empire Mfg. Co. Ltd., London, Ont.: A. J. Palmer, Empire Mfg. Co. Ltd., London, Ont.; N. K. B. Patch, Lumen Bearing Co., West Toronto, Ont.; E. B. Rouse, Warden King, Montreal; James Shand, Dodge Mfg. Co., Toronto, Can.; Robt. Saville, Taylor-Forbes Co., Canada; G. D. Smith, Canadian Steel Foundry Co., Montreal, Que.; G. Service, Steel & Radiator Ltd., Toronto, Canada; H. V. Tyrell, Canadian Foundryman, Toronto, Can.; T. W. Turner, Allis-Chalmers-Bullock, Montreal; Sam H. Todd, Todd-Dominion Radiator Co., Toronto, Canada; A. H. Tallman, Tallman Brass & Metallic, Hamilton, Can.; A. M. Tait, Wortman & Ward Co., London, Ont.; Frank White, The Geo. White & Sons Co., London, Ont.; Arthur G. White, The Geo. White & Sons Company, London, Ont.; Joseph Wright, Dominion Radiator Co., Toronto, Canada; Geo. Woods, Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.; Geo. H. Weaver, Dominion Foundry Supply Co., Montreal, Can.

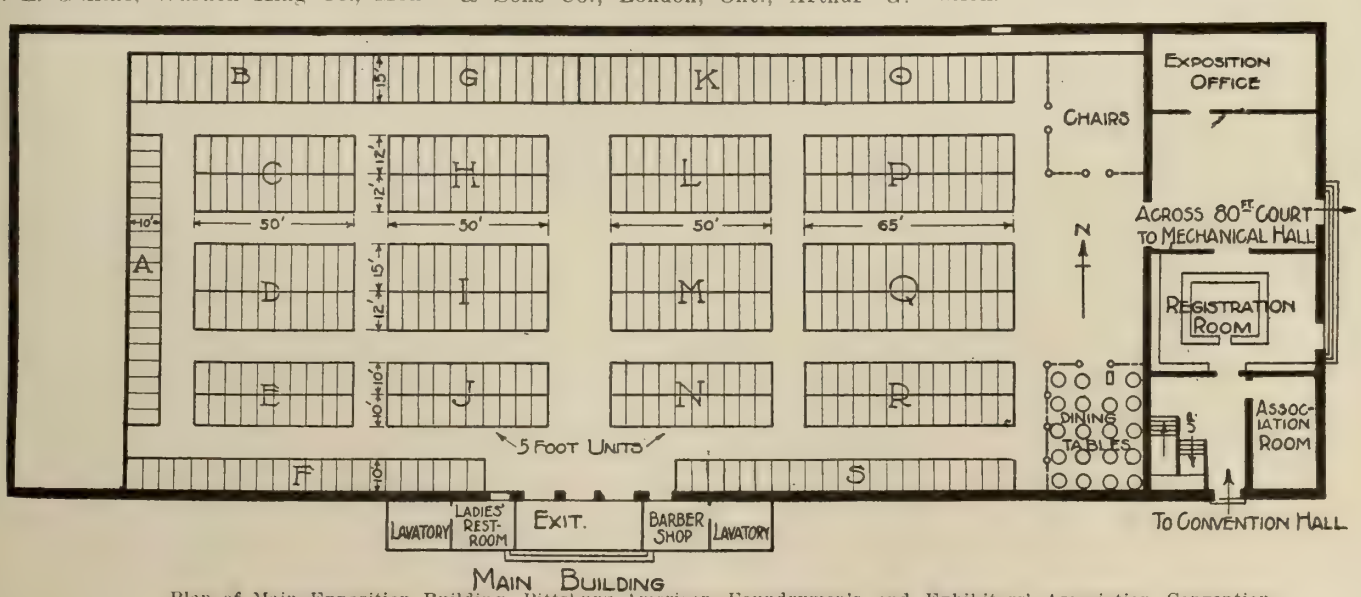
Convention Closing.

Buffalo was chosen unanimously as the next convention city, all the other cities having withdrawn from the contest.

The American Foundrymen's Association elected the following officers: President, J. T. Speer, Pittsburg; secretary and treasurer, Dr. Frederick Moldenke, Watchung, N. J.; Vice-Presidents, F. V. Miles, Buffalo; Walter Wood, Philadelphia; A. E. Howell, Nashville, Tenn.; R. C. Bull, Granite City, Ill.; T. W. Sheriff, Milwaukee; D. R. Lombard, Augusta, Ga.; S. B. Chadsey, Toronto, Canada.

Officers elected by the American Brass Founders' Association are: President, L. W. Olsen, Mansfield, O.; secretary and treasurer, William N. Corse, Buffalo, N. Y. Vice-presidents, for New York and New Jersey, John S. Thompson, Orford, N. J.; rolling mill district, R. T. Roberts, Hastings on the Hudson, N. Y.; New England district, P. F. Augenbraum, Stamford, Conn.; Pennsylvania district, G. H. Clamer, Philadelphia; Chicago district, R. C. Faunt, Chicago; Michigan district, H. W. Gillette, Detroit; Southern district, J. S. Sharp, Chattanooga, Penn.; Ontario and Western provinces, N. K. B. Patch, Toronto, Canada; Quebec and Eastern provinces, R. K. Mitchell, Montreal, Quebec.

The Associated Foundry Foremen closed their convention by electing the following officers: Robert B. Thompson, Buffalo, president; William H. Woods, Pittsburgh, vice-president; Hugh McPhee, of Tarrytown, N. Y., secretary-treasurer. Mr. Woods is the president of the Pittsburgh Foundrymen's Association.



Plan of Main Exposition Building, Pittsburg, American Foundrymen's and Exhibitors' Association Convention.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

TORONTO ONT. J. F. Brown has retired from the metal furniture business and will devote his entire attention to the Ontario Brass & Copper Co., of New Toronto, of which he is owner and president. An extensive addition will be made to the plant.

MONTREAL, QUE. It is announced that the contract for the dry dock here has been definitely awarded to Vickers' Sons & Maxim. The subsidy to be paid to the contractors by the Federal Government will be at the rate of 4½ per cent. on a capital outlay of $3,000,000 for thirty eight years. The drydock will have a lifting capacity of 25,000 tons, sufficient to accommodate any vessel likely to use the St. Lawrence route for many years to come.

OTTAWA ONT. The Public Works Department will call for tenders within a few days for very extensive harbor works at St. John, totalling in aggregate cost probably four or five millions. There will be a dry dock built with an extensive ship repairing plant in connection. Docks will be built providing three berths for the G.T.P. ocean steamship service. Several companies backed by British capital are ready to tender for the whole of the proposed works. The department is also calling for tenders for an extension of the wharf at Champlain market, Quebec, in connection with the National Transcontinental Railway terminals.

KINGSTON, ONT. The Canadian Locomotive Co., of Kingston, has sold out to an English syndicate composed chiefly, it is understood of Lord Glenconner Darlborough Pryor, J. Leigh Wood, and F.R.S. Balfour, who recently visited Kingston to inspect the works. The price paid is said to be large. At present, the capital stock of the company is $500,000. This will be substantially increased. The company has a capacity of three locomotives a week.

QUEBEC, QUE.—The greatest railway workshops in Canada outside of Winnipeg will be erected within a few miles of Quebec City in connection with the Grand Trunk Pacific, according to plans presented. Tenders for the shops will be called for as soon as details are arranged.

VANCOUVER, B.C.—An English company, with a Vancouver board of directors, will, in a few days, be registered with a capital of $20,000,000 to start and carry on business at Pitt Meadows.

The object of the company is to acquire large ore and coal lands, the latter on Vancouver Island and a site on which the necessary works will be erected. Blast and open hearth steel furnaces, and rolling mills, are to be part of the plant. W. Owen, M. E., of London, England, is handling the project. The plant and machinery are to be brought from Europe and will consist of blast furnaces, open hearth steel furnaces and rolling mills of a very large scale and there will also be foundry and engineering shops for renewals and repairs. At least 2,000 men are to be employed. The full capacity of the works will be 1,000 tons a day, and the company estimate on 250,000 tons a year in finished products. The conservative estimate would still keep only busy for an additional 50,000 tons.

ORILLIA ONT. The Tudhope Motor Co. recently purchased the Orillia Foundry building from W. Beal. Oxy-Blowpipes mixed with oxygen, produce a terrific heat and melts any metal. Two metal pieces can be welded together without breaking and without the use of another metal. The outfit is portable and light and can be carried from room to room or from shop to shop as required. It is used to operate for welding brazing soldering etc. and supplied to more other than nothing simply heating to full cases.

PETERBORO' ONT. At the recent fire breaking out in the cut pump works here $20,000 damage was done. The stock are now a total wreck.

PEMBROKE ONT. In an effort to get the C.N.R. shops to locate here the Board of Trade has appointed a committee to interview the railway officials and point out the town's advantages.

The Oliver Plow Works, Hamilton, Ont., have awarded to H. Christman & Co., of South Bend, Ind., contracts for two more large buildings. One is the paint building, 64 by 350 feet, three storeys high, which will be reinforced concrete, costing about $100,000, and an office building, two storeys and basement, 46 by 101, costing $30,000. As soon as these are completed, two foundry buildings, an immense warehouse and a forge shop will be erected.

INGERSOLL, ONT.—The John Morrow Screw, Limited, are preparing to expend $150,000 on their plant here.

OTTAWA, ONT.—Hon. Mr. Pugsley has given notice of a resolution calling for the ratification of an agreement between the Government and the Collingwood Shipbuilding Co., for the construction of a dry-dock at Collingwood. The agreement provides that the Government may pay the company a subsidy of three per cent. for twenty years upon $306,965, the cost of the dry-dock.

PRESTON, ONT.—The Car & Coach Co. are building another erecting shop, and what is now known as No. 1 shop will be converted into a mill and machine shop.

VANCOUVER, B.C.—The Pacific Marine Engineering Co. have completed a new factory and are manufacturing power and sail yachts of all types up to 90 feet. The mechanical equipment is thoroughly up-to-date. A large number of skilled mechanics and machinists are employed by the firm, which promises to be an important factor in the boat-building industry.

REGINA, SASK.—The Farmers' Steel and Wire Co. are about ready to start manufacturing farm, field and ornamental fences. It is their intention to enlarge the present plant if business warrants, and also start a bedspring factory.

GUELPH, ONT.—The rumor that the Page-Hersey Co. will move their Guelph plant to Welland is evidently erroneous. At present, they are erecting two large storehouses and are installing new machinery.

VANCOUVER, B.C.—An early start will be made on the construction of the big, 15,000-ton steel floating dry-dock to be located near Roche Point at the entrance to the North Arm of the Inlet. Cable advices have been received from the firm of prominent capitalists who are supplying the capital required for the local dry-dock, which will be built on the Tyne and shipped out here, to the effect that these capitalists had taken over the assets of the old Vancouver Dry-dock Co., organized some years ago. In taking over the old company the promoters had increased its capital to $1,500,000. Arrangements have been made by the organized company to commence operations in time to receive the Dominion Government subsidy granted some time ago, for the construction of a dry-dock of the second class as approved and suitable for naval requirements.

TORONTO, ONT.—The Lake Superior Corporation has formed another company under the name of The Superior Rolling Stock Co., Limited. The new company, as its name indicates, will manufacture locomotives, cars, rolling stock, etc. The authorized capitalization is one million dollars, and the provisional directors include Thomas Gibson, general counsel for the corporation.

PORT ARTHUR, ONT. The Port Arthur Wagon Works Co. announce that building operations will at once be commenced for their big plant here which will turn out 250 wagons per week.

CHATHAM, N.B.—Miller's Foundry has been moved to make room for railroad purposes. Both the machine shop and moulding shop have been re-arranged.

TORONTO, ONT.—An American firm, the York Safe & Lock Co., of York, Pa., has secured the contract for the erection of the vaults in the new million dollar Bank of Toronto Building. This means that Canadian vault builders and workmen have lost a contract amounting to about $150,000.

ALBERNI, B.C.—A survey has been made for the E. & N. Railway's roundhouse and machine shop to be located on Lupsie Cupsie Point, near here.

SAULT STE. MARIE, ONT. In a disastrous fire at the charcoal plant of the Standard Chemical Iron & Lumber Co., Steelton, the entire retort plant was destroyed and is a total loss. The damage will reach many thousands, covered by insurance. It will be re-built.

PORT ARTHUR, ONT.—J. S. Small, of Detroit, is conferring with the civic industrial committee with the view of establishing an automobile factory here.

MAHONE, N.S.—A. E. Ernst, son of E. A. Ernst, who has held the position of foreman with the Truro Machine Company for the past year, has severed his connection with that firm, contemplating a trip west. Mr. Ernst is being urged to remain here and open up a machine shop.

MONTREAL, QUE.—Losses by smoke and water estimated at $85,000, fully covered by insurance, were caused by a fire in a building on Wellington Street, occupied by the Canada Machinery Co., the Ives Modern Bedstead Co., and the Factory Waste and Metal Co., and the Canada Office Furniture Co.

WELLAND, ONT.—At the annual meeting of the Board of Directors of Canadian Billings-Spencer Works, it was decided to make preparation for the construction of an addition to the present factory buildings. The new building will be two storeys in height, of concrete construction and 100x50 feet in size.

WELLAND, ONT.—The Dominion Metals, Ltd., of Toronto, will build a thoroughly up-to-date silver and gold smelting and refining plant here.

NORTH BAY, ONT.—M. Davey has leased the Nipissing Foundry & Machine Co. for a term of years and is now in possession. He has moved his wire works to the foundry.

HESPELER, ONT.—The A. B. Jardine Co. are building a large moulding shop, 60x60. This is the second time this year that this company has been forced to enlarge its plant.

AMHERST, N.S.—The Canada Car Co., have made arrangements to re-build their works here. The new building will be of concrete and steel. The freight car department, representing 90 per cent. of the output and the wages, will remain closed until the new shops are completed.

TORONTO, ONT.—The Maritime Nail Works at St. John, N.B., has been disposed of by R. L. Johnston to Toronto interests for about $200,000, the transfer to be made June 1. Definite announcement as to the intentions of the new owners is expected at any time.

WELLAND, ONT.—The Imperial Manufacturing Co, manufacturers of hardware, of Warren, Pa., will locate a branch factory here.

TORONTO, ONT.—The Hupp Motor Car Co., of Detroit, are preparing to enter the Canadian field. They will manufacture their cars in Canada and establish a new selling price. Their car now sells for $900 in Detroit.

QUEBEC, QUE.—W. H. Wiggs has secured a site from the C.N.R. and will erect a large warehouse for his business, the Mechanics' Supply Co. He will carry a large stock of iron pipe, radiators and "Daisy" boilers.

MONTREAL, QUE.—The McArthur, Perks Co., of Ottawa, has been awarded a contract to build four concrete docks at Havana by the Port of Havana Docks Co., of which Sir William Van Horne is president. The Ottawa company is the one formed by Sir Robert Perks, and the contract it has secured at Havana amounts to about $6,000,000.

LONDON, ONT.—The McClary Company are planning a big extension to their East End works here. They have taken out a permit for an $18,000 cement building for manufacturing purposes.

PORCUPINE, ONT.—Fire did $70,000 damage to the plant on the Hollinger property here recently.

FREDERICTON, N.B.—The New Brunswick Foundry was practically wiped out by fire recently. The loss was upwards of $50,000, including the patterns which had accumulated in 40 years operation of the plant. About $15,000 insurance was carried, largely in the Atlas Co. The matter of re-building is as yet, undecided.

VANCOUVER, B.C.—The Munro Steel & Wire Works, of Winnipeg, will build a plant here to cost approximately $50,000.

CLARKSBURG, ONT.—J. L. Lake has leased the Clarkesburg Foundry and Machine Shop and is now in charge.



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The opening of this warehouse will enable us to give our customers in this district the same efficient service enjoyed by our customers in the vicinity of our Ottawa and Winnipeg houses.

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JOHN STEPTOE SHAPER CO.—Shapers.
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MUELLER MACHINE TOOL CO.—Radial Drills.
H. G. BARR—Sensitive Drills.
STANDARD PRESSED STEEL CO.—Steel Hangers.
CLEVELAND TWIST DRILL CO.
SOUTH BEND MACHINE TOOL CO.—Lathes.
HISEY-WOLF MACHINE CO.—Electric Drills.
AMERICAN PULLEY CO.—Pressed Steel Pulleys.
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VANCOUVER, B.C.—The Otis Elevator Co. are building an office and warehouse here at a cost of $200,000.

OWEN SOUND, ONT.—The citizens carried a by-law granting the C. S. Lloyd & Co., of Toronto, a loan of $25,000 at 4½% interest to erect a factory here for the manufacture of children's carriages and wagons, and steel wheels for various kinds of vehicles.

PETERBORO', ONT.—The Model Foundry and Pump Works have commenced operations.

PORT HOPE, ONT.—The new high carbon tool steel plant of the International Tool Steel Co., is practically completed and it is expected that operations will start this month. The Standard Ideal Co. have also planned large additions to their plant.

PRINCE RUPERT, B.C.—The Board of Trade are endeavoring to persuade the Granby Co. to establish a smelter here.

TORONTO, ONT.—The new factory of the Gilbert Mfg. Co. is now completed. The company will manufacture stamped copper, nickel, brass and metal goods of every description, using the very latest machinery and dies.

FORT WILLIAM, ONT.—Defective construction caused a fire that did $100 damage to the brass foundry of the Lumby-Stenhouse Co., recently.

PORT ARTHUR, ONT.—It is reported that Sir Donald Mann will come here at an early date with a view to establishing a foundry.

GUELPH, ONT.—Tolton Bros. are making a shipment of harvesters' implements to Australia. The machine shop has been quite busy of late keeping up with the orders. They have the contract for the brackets for the hydro-electric street lights.

OTTAWA, ONT.—The Kingston Shipbuilding Co. has been awarded the contract for the building of the new Government steamer, Dollard. The boat will be used in connection with the lighthouse and buoy service in the Montreal district. The contract price is around $160,000.

BRANTFORD, ONT.—The Buffalo Brake Beam Co. is establishing a plant here and will manufacture brake beams for passenger and freight cars.

TORONTO, ONT.—The Massey-Harris Co. are building an additional factory at their works here.

VANCOUVER, B.C.—According to information on the authority of A. P. Gillies, the British Columbia Steel Co., a $10,000,000 corporation, will establish steel rail plants at Port Mann, the Canadian Northern's Pacific terminus, and at Tacoma. The company has acquired an interest in the townsite at Port Mann, and has agreed to erect at least one thousand dwellings to cost not less than $2,000 each.

Arrangements have been completed with the American Car and Foundry Co. to establish a plant at Port Mann with an initial pay-roll of 2,000 men. The plant will turn out steel freight, passenger and sleeping cars, using the available ores at hand. The Pittsburg Plate Glass Company also will establish a plant there, having found sicilia of the best quality in the adjacent district. The furnaces of the steel mills is to be utilized in furnishing fuel for the glass plant.

LONDON, ONT.—The George White Sons Co. is planning extensions of its trade in Western Canada and will, shortly, establish several branches in addition to those now existing at Brandon and Saskatoon.

MONTREAL, QUE.—Fire did approximately $75.000 damage to the Allis-Chalmers-Bullock factory near Lachine, recently. The fire did little damage to the building, which is iron and glass mainly. But everything it contained, including the traveling crane, and all the testing machinery was destroyed, and this being the finishing department for most of the machinery turned out, will greatly hinder some of the other shops. Temporary quarters have been fitted up to keep the work going.

GUELPH, ONT.—The Page-Hersey Pipe Mills here were damaged by fire to the extent of $5,000. The cutting room suffered considerably.

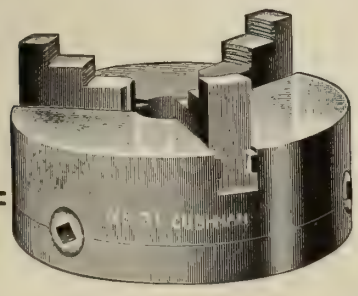
OTTAWA, ONT.—The inauguration of a big shipbuilding enterprise on the Pacific Coast to take a share in the building of Canada's new naval vessels is presaged by the passing of an Order-in-Council granting a subsidy for a dry-dock and ship repair plant of the first-class to the Esquimalt Graving Dock and Shipbuilding Co. According to the estimate of the engineers of the Department of Public Works on the plans submitted, the total cost of the dry-dock with repair machinery, building, etc., will be $2,637,800. The dock will be 900 feet long, 41 feet deep, and 128 feet wide and capable of accommodating the largest vessels afloat. The promoters are Messrs. Bullen, the well-known shipbuilders of the Pacific Coast, who have associated with Denny Bros., of Dunbarton, Scotland, one of

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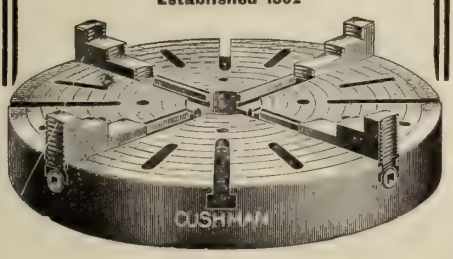
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the largest shipbuilding firms in the United Kingdom.

MONTREAL, QUE.—Fire did $20,000 damage to the city workshops recently.

MONTREAL, QUE.—The city is calling for tenders for the filtration plant. Contract No. 1 includes the furnishing and installing of pumping machinery, rotary blower and cranes.

HALIFAX, N.S.—Anticipating the construction of the new Canadian navy, the Nova Scotia Steel and Coal Co., are about to install machinery and adopt a process of manufacturing far in advance of anything yet attempted in Canada which will enable them to manufacture all classes and kinds of the heaviest steel forgings. A new forge house equipped with massive hydraulic forging presses is to be built at New Glasgow. Some idea of the size of the new machinery may be gained from the fact that single pieces of it weigh 80,000 pounds, and the effective power of at least two of the presses will be in the vicinity of 100,000 pounds pressure.

WINNIPEG, MAN. — Thirteen wooden bridges will be replaced on the C.P.R. between Vancouver and North Bend, with steel and concrete structures. A total of thirty new bridges will be put up along the same stretch of line.

OTTAWA, ONT.—A large tool manufacturing company will locate here if satisfactory terms are secured from the city,

GALT, ONT.—The Down Draft Furnace Co. are erecting a large addition for their nickel-plating department.

WINNIPEG, MAN.—The C.P.R. has awarded several contracts for improvements in the Weston shops.

Carter, Halls and Aldinger have been awarded the contract for the erection of a large upholstering shop. This building will be 98 feet long and 74 feet wide and 16 high.

The J. McDiarmid Co. will build a new boiler shop, the dimensions of which will be 286x118 feet feet. The building will be constructed of brick.

In addition to these the Jackson & Golding Co., of St Boniface, have been awarded the contract to put in concrete foundations for a new transfer table.

VANCOUVER, B.C.—The firm of McDougall, Jenkins Engineers Ltd. of North Vancouver, are building a $150,000 extension to their plant. This price includes the figure at which the stock machinery and other assets of the Albion Iron Works were acquired.

MONTREAL, QUE.—Work has been started at the Angus shops on an order for 2,000 steel box cars. This is the second part of a $3,500,000 order placed last fall.

WINNIPEG, MAN.—The $1,500,000 contract at Transcona for the completion of coach shops and buildings has been awarded to Haney, Quinlan & Robertson, which firm has just finished the erection of the shops at Transcona for the commission and the Grand Trunk Pacific.

MONTREAL, QUE.—The C.P.R. Angus shops recently issued ten new switching engines of standard size, to be distributed along the company's lines.

Municipal

GALT, ONT.—The by-law authorizing expenditure of $25,000 on the hydro-electric system was carried.

TRENTON, ONT.—A by-law will be submitted to raise $700 by way of debentures to purchase site for a baby carriage factory.

LINDSAY, ONT.—Lindsay is to be asked to loan $50,000 in the matter of the re-organization of the Sylvester Manufacturing Co.

GUELPH, ONT.—The Independent Tire Co. will locate here.

CHATHAM, ONT.—An $80,000 pork and beef packing plant is to be erected here by O'Keefe & Drew. It is being built for the purpose of taking care of 75 per cent. of the hogs and cattle slaughtered in the western peninsula.

MELVILLE, SASK.—The following by-laws were passed here: Electric light, $23,000; sewers, $5,000, and waterworks, $63,000.

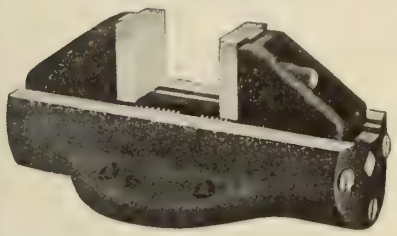
VANCOUVER, B.C.—By-laws aggregating $1,370,000 will be voted on as follows: Sewers, $750,000; Clark Drive, $35,000; street improvements, $60,000; water, $115,000; street improvements, $75,000; water, $75,000; main along Seymour Creek, $100,000; grading, rocking and planking, $100,000; isolation hospital, $50,000; jail, etc., $30,000.

ESTEVAN, SASK.—Two by-laws will be submitted to the ratepayers for approval, $5,000 for waterworks extensions, and $18,000 for cement sidewalks.

PORT ARTHUR, ONT.—Three by-laws will be voted on as follows: Street railway purposes, $25,000; floating debt, $15,000, and $100,000 for the extension of the intake pipe and an additional standpipe.

Two-Jaw Box Chucks

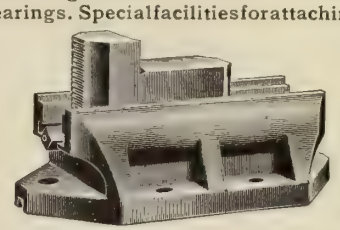
Specially designed for fast, continuous and accurate turret lathe work.



Body and sliding jaws made from steel castings. Strong, durable--yet light in weight.

Face Plate Jaws

Have large screws with double thrust bearings. Specialfacilitiesforattaching.

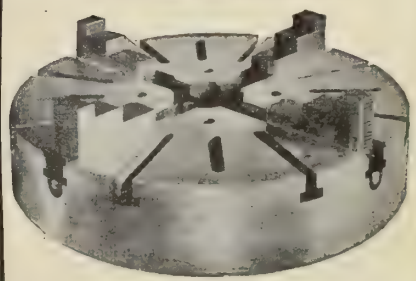


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Brantford, Canada

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More Likely to be Accurate.
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CRANBROOK, B.C.—A by-law to install a sewer system in Cranbrook carried.

MONTREAL, QUE.—The city contemplates on expenditure of $1,293,883 on water mains and sewers.

NORTH BAY, ONT.—Two by-laws will be voted on, $45,000 for sewerage purposes, and $100,000 for waterworks.

WINDSOR, ONT.—The city contemplates a by-law to expend $50,000 for an intake and construction in connection with new water supply.

SOUTHAMPTON, ONT.—The by-law to expend $7,500 to extend the waterworks system here was carried.

SCOTT, SASK.—By-laws authorizing the installation of waterworks, sewerage and electric light have been carried by a large majority.

WINDSOR, ONT.—A by-law will shortly be submitted to provide $50,000 for the extension of water mains.

SUDBURY, ONT.—By-laws are under consideration aggregating $100,000 to $150,000 for municipal improvements, including water mains, trunk sewerage mains, lake sewerage disposal, auxiliary fire pumping plant, new fire hall and apparatus, fire alarm system and permanent roads.

OTTAWA, ONT. — By-laws aggregating $330,000 will shortly be submitted, $150,000 to complete the waterworks aqueduct, $60,000 for a booster system, $45,000 water mains, and $80,000 for the high-level bridge over Bank Street.

RENFREW, ONT.—The ratepayers recently passed a by-law granting $3,000 for sewerage.

ESTEVAN, SASK.—Two by-laws will be submitted to the ratepayers for approval, $5,000 for waterworks extensions, and $18,000 for cement sidewalks.

BERLIN, ONT.—Fourteen thousand dollars profit was shown at the end of last year from the operation of the Berlin waterworks department. For years past surpluses have been shown by this department, but the money has been spent in extensive additions to the system.

VICTORIA, B.C.—Victoria ratepayers have carried three of the five money by-laws submitted. Each received a three-fifths majority. Those carried were a vote of $150,000 additional school expenses asked for by the school board and declined by the city council; $300,000 for extending the sewer system, and $30,000 for an alteration to the market building for other civic purposes.

WILKIE, SASK.—The town council have engaged a municipal engineer and it is likely that Wilkie before the fall will have a complete system of waterworks.

MOOSE JAW, SASK. In the electric light department there will be expenditures this year of $50,000 for improvements and extensions. Of this amount $15,000 is to be spent on ornamental street lights. A sum of $35,000 is to be spent on electric light extension in addition to the ornamental improvement.

PENTICTON, B.C.—Tenders will be received for the following debentures; $150,000 40 years 5 per cent. domestic water loan; $71,000 40 years 5 per cent. electric light.

STETTLER, ALTA.—Tenders will be received for $17,000 20-year 5½ per cent. electric light; $6,000 10-year 5½ per cent. local improvements; $2,000 20-year 5½ per cent. chemical engine and hose, and $3,500 20-year 5½ per cent. municipal buildings.

COBALT, ONT. Tenders will be received for $43,500 waterworks and sewerage, debentures, 6%, 10-year sinking fund bonds, issued under by-law No. 143, and confirmed by Chap. 87, Statutes of Ontario, 1911.

Electrical.

MONTREAL, QUE.—The Canadian Light & Power Co. have completed arrangements for using the power house and plant of the Central Light, Heat & Power Co., which they acquired some time ago. The deal was put through four months ago, the price paid being half a million dollars. At the time, however, no details were available regarding the plans of the Canadian Co. The present capacity of the power house, 2,000 horse-power, will suffice for present needs, but it is the intention of the Canadian Light & Power Co. to extend the business as much as possible. With this end in view the present steam-driven dynamos will be removed as soon as possible and the power brought from the Beauharnois power houses of the company.

LINDSAY, ONT. Lindsay will submit a by-law to raise $230,000 for the purpose of purchasing the plant of the Light, Heat and Power Co.

GUELPH, ONT.—Niagara power is now being used exclusively by the Light and Heat Commission in supplying light and power to its patrons.

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MIDDLETON, N.S.—This town is contemplating a by-law to borrow $15,000 for the purpose of purchasing and installing an electric light plant.

PRINCE ALBERT, SASK.—The city is calling for tenders for the construction of a dam and headworks and canal and power station foundations which are portions of the proposed Hydro-Electric Power Development, on the North Saskatchewan River, at La Colle Falls.

LETHBRIDGE, ALTA.—The Carmanga town council is taking steps to install a municipally-owned waterworks and electric light system. They have already secured an option on the electric light plant owned by C. W. Carman, which lights the town at present.

ST. JOHN, QUE.—Fire destroyed half a dozen small residences and then spread to the municipal electric plant, which was also wiped out. The total loss is placed at $75,000, with insurance of about half that amount.

HAMILTON, ONT.—Machinery will be installed at the Cataract Power plant to raise the capacity from 38,000 to 60,000 h.p.

NELSON, B.C.—Intimation is given of a new electric power proposition of great magnitude in papers made out by A. L. McCulloch, mining engineer, of Nelson, giving notice that on June 16 he will apply to W. F. Teetzel, water commissioner for the Nelson water district, for a license to use 6,300 cubic feet of water per second for power purposes, from the Kootenay river.

WINNIPEG, MAN.—The first actual business addressed to the new civic power manager, J. B. Rossman, was received by Mr. Rossman at the city hall recently. This was contained in a letter from the local industrial bureau asking for a definite price on 100 24-hour horse-power. This power is wanted by a new industry, which it is proposed to establish in the city. The buildings for this plant will cost approximately $125,000.

EDMONTON, ALTA.—The city council are preparing to spend a quarter of a million dollars for the purchase of machinery for the power plant.

MONTREAL, QUE.—Plans for the construction of an immense dam at the foot of the Coteau Rapids, in the St. Lawrence, which, if completed, would mean the development of an equally large amount of water power, are now under consideration by a commission of Government engineers. The Canadian Light & Power Company is promoting the scheme.

RENFREW, ONT.—$125,000 will be spent for new electrical equipment.

SANDWICH, ONT.—R. Stuart will erect a power house here.

KNOWLTON, QUE.—A municipal power plant will be started here.

ST. JOHN, N.B.—The Eel River Light, Heat & Power Co. will build a large power plant near here.

MAGOG, QUE.—A new power station will be built here.

PRINCE RUPERT, B.C.—The Prince Rupert Power Co. will build a lighting plant here, to cost $3,000,000.

TAVISTOCK, ONT.—$30,000 will be spent on electrically-operated pumps for waterworks.

NORTH BAY, ONT.—North Bay will buy $100,000 worth of electrically-operated waterworks machinery.

MIDLAND, ONT.—The electors have declared in favor of Hydro-Electric power. The by-law provides for the expenditure of $13,000, and the service will include both power and light. It is only necessary to string wires to complete the equipment, and this, it is expected, will be done by June 1.

VANCOUVER, B.C.—Notice has been given of the application of the Howe Sound Power Co., for water rights for power purposes on Furry Creek, a stream which flows into Howe Sound at a point three miles south of Britannia Beach. The Howe Sound Power Co. is noted as a concern with a capital of $100,000. The promoters decline to give any particulars concerning the development of the Furry Creek power, but the details noted in their application show that the plans in mind are extensive.

General Manufacturing

MONTREAL, QUE.—J. C. Wilson & Co., paper manufacturers, will build a large fireproof building here this summer.

REVELSTOKE, B. C. Chas. A. Barnum, general manager of the Diamond Mills Co., and the Dominion Securities Co., is handling a big project, which involves the building of pulp and paper mills in the interior, the erection of a large sawmill at the Big Eddy, the construction of a large power dam on the Columbia river, the syndicating of about seven hundred thousand miles of pulpwood and timber and the initial investment of several millions of dollars, while as an outcome of all this increased enterprise a large army of men will be employed.

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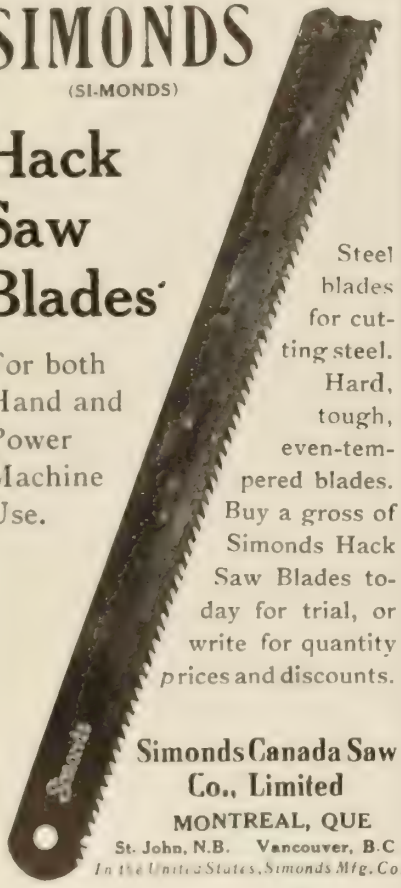
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by the very highest class of skilled mechanics.
Only the highest grade of material used in our work. We can handle your pattern work to your complete satisfaction.
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Schumacher & Boye, Cincinnati, - - - Lathes
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For both Hand and Power Machine Use.
Steel blades for cutting steel. Hard, tough, even-tempered blades. Buy a gross of Simonds Hack Saw Blades today for trial, or write for quantity prices and discounts.

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NEW GLASGOW, N.S. - The Pickering Wheel Co. is preparing to establish a factory here. The new concern will cater particularly to the heavy wheel trade, such as express and wagons and heavy cartage.

BELLEVILLE, ONT. The Allard Platinum & Gold Refining Co., of Rochester, N.Y., propose establishing a plant here.

CHATHAM, ONT.—Tripplehorn Bros., of Findlay, Ohio, have decided to open a cement and tile manufacturing industry in this city, to be known as the Chatham Cement Tile & Block Co. They will erect two buildings 60 by 70 feet and 40 by 75 feet

SHERBROOKE, QUE. A new industry has started in Sherbrooke, known as the Railway Asbestos Packing Co. They expect to erect their own factory later on.

LINDSAY, ONT.—Horn Bros. are building an addition to their factory here.

SARNIA, ONT.—The Lott Lawn Fence Co. have opened a new business here to manufacture ornamental lawn fence and patent gates.

PORTAGE LA PRAIRIE, MAN.—The Great West Bedding Co. are locating here.

PORT ARTHUR, ONT.—R. McArthur, of Deseronto, is establishing a match factory here.

MULGRAVE, N.S.—G. T. McNutt is establishing a woodworking factory here.

SARNIA, ONT.—The Port Huron Creamery Co. have opened up an up-to-date plant here.

CALGARY, ALTA.—Either next fall or early next spring, work will be started on a million-dollar packing plant in Calgary. It is to be built by the large packing concern known as Morris & Co., of Chicago, of which the Dominion Meat Co., of Calgary, is a branch.

BROCKVILLE, ONT.—The National Manufacturing Co. will locate here.

SARNIA, ONT.—The Canadian Woodworkers are building a new factory here. It will be of re-inforced concrete.

GUELPH, ONT. The city council has granted fixed assessments of $1,000, except for school taxes and local improvements, to four firms. They are the Colonial White Wear Co., the Canada Textile Weaving Co., the Emery Manufacturing Co., and the Taylor Stratton Dairy Co. The first-named company is to erect a new building on another site and increase the staff by 150 hands.

KENORA, ONT.—A new industry, known as the Gullberg-Ekberg Co., recently started operations for the manufacture and sale of tar, creosote, turpentine, charcoal, etc., at the Winnipeg river crossing of the Grand Trunk Pacific. The plant is in close proximity to the Winnipeg river on the new townsite, and the location warrants a splendid supply of raw material very easily assembled by the river.

BERLIN, ONT.—The following factories will make extensions this year: Kaufman Rubber Co., L. McBrine & Co., D. Hibner & Co., Kaufman Planing Mill, Canadian Pyrofugont Co., Cloisonne Art Glass Co., Lang Tanning Co., C. H. Doerr & Co., Interior Hardwood Co. and Walker Bin and Fixture Company.

GODERICH, ONT.—An English syndicate purposes establishing a big works here to manufacture salt by a new process.

TORONTO, ONT.—The Royal Shoe Co. have purchased a factory and will locate here.

OWEN SOUND, ONT.—Two by-laws were carried here recently. The knitting factory by-law passed gives Lake and Ward, promoters, a loan of $15,000 for twenty years at 4½ per cent. The second one was a by-law to loan $25,000 at 4½ per cent. for twenty years to parties identified with the Adams Furniture Co., of Toronto. The new factory will manufacture high-class furniture and upholstered goods.

MONCTON, N.B.—The A. J. Burton Saw Co., Vancouver, are asking the Board of Trade what the city will give them if they move a part of their saw plant to Moncton. They would employ about 50 men.

ST. CATHARINES, ONT.The old McCleary & McLean lumber yard will be fitted up and a tissue paper factory take its place. New machinery will be installed and water power used.

Building Notes

AURORA, ONT. The by-law to loan the Positive Clutch & Pulley Works $10,000 was carried.

VANCOUVER, B.C.—The C. P. R. intend erecting a ten storey office building here, to cost $200,000.

EDMONTON, ALTA. R. F. Klein has organized a company to erect an $85,000 hotel here this summer.

WINNIPEG, MAN. D. McDonald, western manager of the Confederation Life, has announced that the institution will proceed with the erection of a ten-storey office building, to cost $1,500,000.

EDMONTON, ALTA.—J. E. Wize, architect, has prepared plans for a six-storey building for Dr. McLean, to cost $130,000.

SASKATOON, SASK.—J. F. Cairns will erect a mammoth departmental store here.

REGINA, SASK.—The plans for the new union depot are completed and are in Regina. The building will cost in the neighborhood of $200,000.

TORONTO, ONT.—The following permits have been granted: M. Rawlinson, six-storey warehouse, $30,000; Western Baptist church, church and Sunday school, $40,000; the Toronto Carpet Co., five-storey factory, $90,000.

VANCOUVER, B.C.—C. Fee has taken a permit to erect a $100,000 block.

TORONTO, ONT.—It has been decided to add three more storeys to the Home Life building, at the corner of Victoria and Adelaide Streets. This will make a nine-storey building. The cost of the work is expected to be about $100,000.

TORONTO, ONT.—The premises occupied by the store of John Catto & Sons, have been purchased by a Montreal syndicate represented by J. Lewis Thomas. The purchasers will erect on this site within three years, a splendid office building about fifteen storeys high.

VANCOUVER, B.C.—Plans have been prepared for a six-storey building to be erected by the Otis-Fensom Elevator Co. Construction will be undertaken this spring and it is announced that the building will cost approximately $100,000. The company is also considering the erection of a warehouse on Railroad avenue.

TORONTO, ONT.—The Dominion Government has decided to expend $500,000 in Toronto in a central building that is to accommodate all the offices at present scattered all over the city.

VANCOUVER, B.C.—A permit was granted the B.C. Sugar Refinery for a filter-house to cost $75,000, to be constructed with steel frame and concrete floors. The architect is Kennedy Bryan.

TORONTO, ONT.—According to Transportation Manager W. G. Brownlee, the G.T.R. will spend several millions in improvements during the present season. One of the schedule undertakings is the construction of a roundhouse at Midland. It is unlikely, however, that any new extensions will be made to the Toronto portion of the system during the coming summer.

EDMONTON, ALTA.—Sherman and Lougheed, of Calgary, will erect a $150,000 theatre here.

CALGARY, ALTA.—Plans and specifications for the C.P.R. hotel call for a 13-storey structure, although but 8 storeys will be built this year. When completed, the cost will be $1,500,000.

TORONTO, ONT.—An initial expenditure of five million dollars, and an ultimate expenditure of between thirty and forty millions, is to go towards the construction of the Canadian Northern terminals in Montreal and Toronto. Thirty million dollars is to be spent in Montreal terminals, in time, and some five or six millions in Toronto.

Planning Mills

AMHERST, N.S.—The mill owned by Rhodes-Curry Co. at Little Forks was totally destroyed recently. The mill was equipped with modern machinery and this spring a large sum of money was used in fitting it out in first-class shape for the summer operations. The mill was 30 feet by 110 feet, and under the same roof were the planing mill, 90 feet by 30 feet, the lath room, 25 feet by 20 feet, and also the boiler room, 40 feet by 20 feet. All these buildings have been wiped out. The loss will be $25,000.

TORONTO, ONT.—Fire did $1,000 damage to the planing mill of J. C. Gilchrist at the corner of Ernest Ave. and Perth. The loss is fully insured.

OTTAWA, ONT.—W. F. MacGlasken, general manager for the Beaver Manufacturing Co., of Buffalo, was in the city to confer with the local officials of the company with a view of building a large factory on Bayswater Ave. The new plant will turn out a quarter of a million square feet daily.

SIMCOE, ONT.—Fire destroyed the planing mill of D. G. McKnight, here, recently. The loss is fully insured.

ST. JOHN, N.B.—A fire of unknown origin caused the complete destruction of J. A. Gregory's saw mill at Lepreaux. The mill is a complete loss, the machinery is probably totally destroyed and 300,000 laths went up in smoke.

HATLEY, QUE.—Fire did several thousands of dollars damage to the saw mill in connection with the Hatley Dairy, Light and Power Co.

WOODSTOCK, ONT.—T. D. Broom & Son have just completed a new factory to supply building materials of all kinds.

HALIBURTON, ONT.—Austin's saw and shingle mill was completely destroyed by fire recently. Loss will be $4,000.

PARRY SOUND, ONT.—The box factory of the Parry Sound Lumber Co. was completely destroyed some time ago.

HALLVILLE, ONT.—The saw mill and cheese box factory of Messrs. Shaw & Earl was damaged by fire recently.

ST. JOHN, N.B.—The new planing mill of Atkin Bros at Fairville, is rapidly nearing completion.

ANNAPOLIS ROYAL, N.S.—The saw mill at Young's Lake, owned by Sylvester Bent, of Belleisle, was burned out recently.

WATERBOROUGH, Q.C., N.B.—M. Vicars steam saw and grist mill was destroyed by fire recently. It is being rebuilt.

NEEPAWA, MAN.—1,000 feet will be added to the floor space of the sash and door plant and planing mill of the Fusee, McFeetors Co.

KINBURN, ONT.—Fire did $350 damage to the saw mill of H. Lowry & Sons, of Marathon.

CHATSWORTH, ONT.—The sawmill of Alex. Brown, on the 2nd line of Derby, was completely destroyed by fire. The machinery is a total loss.

PORT ARTHUR, ONT.—The city has concluded an agreement with J. L. McRae to establish a factory to cost $60.000, to manufacture interior finishings, the city guaranteeing the bonds for half that amount on first mortgage.

MEDICINE HAT, ALTA.—J. H. Preston will spend $50,000 on a planing mill business here.

VANCOUVER, B.C.—Davidson & Labsik, manufacturers of sashes and doors, have assigned.

VANCOUVER, B.C.—The saw mill of W. H. Day, suffered loss by fire some time ago.

A METAL MERGER.

By the amalgamation of the King Radiator Co., Montreal, the Expanded Metal Fire Roofing Co., Toronto, and a number of other important plants, another merger in the basic industries has been effected in Toronto. The combination involves a five million dollar capitalization and in addition to the existing plants in Toronto and Montreal, it is understood that contracts have been awarded for the erection of a large factory in St. Catharines which will supplement the company's output in the larger cities. It is also understood that options on two important industries of a similar character in the Maritime Provinces will be closed and the activities of the new combination will then extend over three-quarters of the Dominion. Toronto banks underwrote $750,000 of the present bond issue of $1,500,000.

New Companies

MONTREAL, QUE.—The Dominion Architectural Ironworks, Ltd., capital $100,000, have been incorporated to manufacture and deal in metal products, and carry on the business of iron-founders, steel-makers steel converters, etc., etc. G. Humphreys, manufacturer; J. R. Estey, engineer; R. Taschereau, T. Rinfret and R. Genest, advocates, all of this city.

LONDON, ONT.—The W. J. Reid & Son, Automobiles, Ltd., capital $100,000, have been incorporated to manufacture, repair and deal in automobiles, motor cars, etc. W. J. Reid, merchant, F. A. Reid, commercial traveler, R. D. Aldrich, sales manager, C. G. Lewis, bookkeeper, all of this city; and G. E. King, capitalist, of Detroit.

MONTREAL, QUE.—The Grand Metis Power Co., capital $100,000, have been incorporated to carry on the business of a light, heat and power company, and acquire all necessary works, engines, machinery, generators, etc., etc. W. J. Shaughnessy, advocate; T. S. Owens, student; A. E. Woodworth, accountant; A. B. Wright and A. Charters, clerks; all of Montreal.

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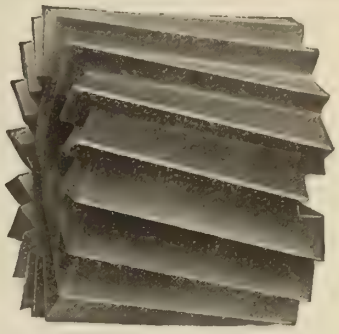
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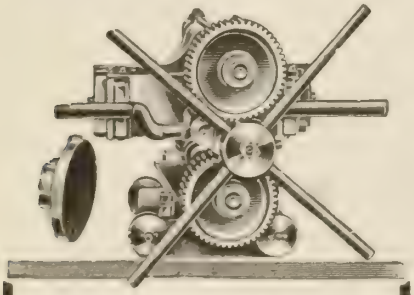
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TORONTO, ONT.—The Masco Co., capital stock $100,000, have been incorporated to carry on the business of electricians, mechanical engineers, manufacturers and dealers in electrical machinery and supplies, etc. E. G. McMillan, law student; J. F. McGregor and W. H. Walter, accountants; H. Riley, law clerk and A. Bicknell, solicitor; all of this place.

VICKERS FLOAT FIVE MILLION FOR CANADA COMPANY.

LONDON, ENG.—Messrs. Vickers, Son and Maxim, shipbuilders and engineers, have applied for powers for the incorporation of their Canadian Company to build and operate a floating dry-dock at Montreal with naval works and factory for the construction of steel railway tires and other industrial operations on the site granted for the purpose under the agreement between the company and the Montreal Harbor Commissioners and the Government of Canada.

The capital of the new company will be $5,000,000, and with the Government subsidy of the first class under the Act authorizing the granting of subsidies for the erection of dry docks, it is expected that the financing will an easy matter and the works will be pushed on so that the floating dock, which will be built at Barrow and will complete the naval establishment well advanced in 1912.

Catalogues.

BOLT MACHINERY—Webster & Perks Tool Co., Springfield, Ohio, have issued a catalogue on coated paper, 30 pages, 9x6 ins., describing bolt pointing, threading, and special tapping machines. All the machines referred to are well illustrated.

Editor Wanted

Graduate of McGill or S.P.S. in Mechanical Engineering to do editorial work on "The Power House" and "Canadian Machinery." State age, particulars regarding practical experience, etc.

MacLean Pub. Co., Ltd;
Eastern Townships Bank Bldg.
MONTREAL

SMALL MILLING MACHINES—The Chicago Machine Tool Co., 127 North Canal St., Chicago, Ill., have just published a catalogue of their Chicago small milling machines. This catalogue deviates considerably from the general run of catalogues, inasmuch as the net prices of both the machines and their attachments, are given. These millers are illustrated in their various sizes and styles from the stripped machine to the complete machine, in each case the equipment and net price of the machine is stated.

ELECTRIC FURNACES—Verdon, Cutts & Hoult, Town Hall Chambers, 87 Fargate, Sheffield, have issued a booklet on electrical manufacture of steel in the Electro-Bessemer furnace. Electric welding and annealing furnaces are also dealt with in the catalogue.

SOLID ADJUSTABLE DIE HEADS — A pamphlet from the Landis Machine Co., Waynesboro, Pa., describes the solid adjustable die head. An illustrated description appeared in a recent issue of Canadian Machinery.

CRANES—The Whiting Foundry Equipment Co., Harvey, Ill., represented in Canada by the Dominion Foundry Supply Co., Montreal and Toronto, have issued Catalogue No. 77, which shows illustrations of a number of recent installations of cranes and other foundry equipment.

MACHINERY—John B. Hall & Sons, Brantford, Ont., have issued a folder containing leaflets which describe a number of machines manufactured by them, including bench grinders, pedestal grinders, lawn mower and skate grinders, hand winches, cold saws, etc.

BALL BEARINGS — A description of "Swivel Double-row Ball Bearings for Shafting," with illustrations, has been received from the Unbreakable Pulley & Mill Gearing Co., Manchester and London, Eng. The Canadian agents are Vandeleur & Nichols, Dineen Building, Toronto.

Book Review.

MACHINE SHOP MECHANICS—By Fred H. Colvin, A.S.M.E., F.I.; 177 pages, 4½x7 ins., illustrated; published by the McGraw-Hill Book Co., 239 West 39th St., New York. Price $1 net.

This book has been given the title of Machine Shop Mechanics, or the "Why of Things in the Machine Shop," as it explains the "why" of many happenings in everyday work, such as friction and the various forces which come into play when any work is performed. There are twenty chapters dealing with levers, the screw and wedge, inclined planers, gravity, friction, heat, inertia, belts and pulleys, block and tackle, gearing, centrifugal force, hydraulics, steam pressure, force of a blow, strength of materials, shafting, action and reaction, beams, measuring moments, and force diagrams. The book will be found of great value to the man who wishes to know the "why" of things.

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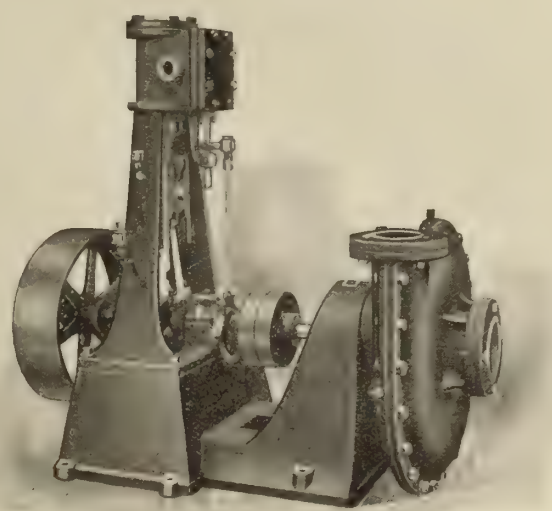
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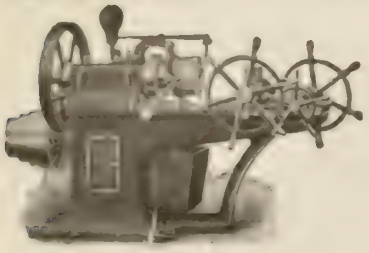
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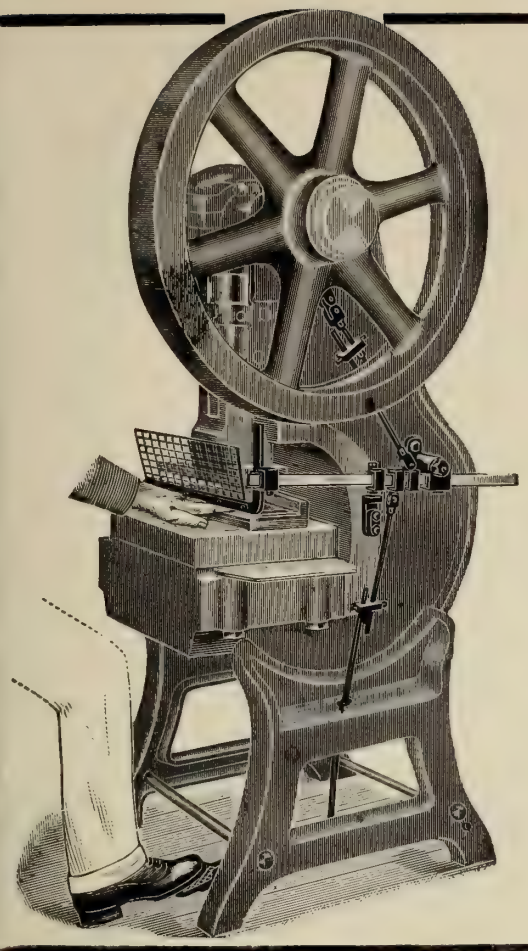


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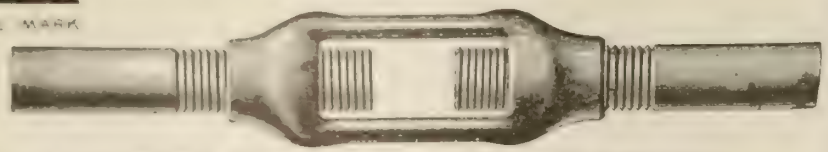
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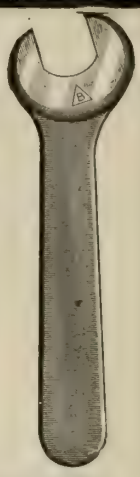
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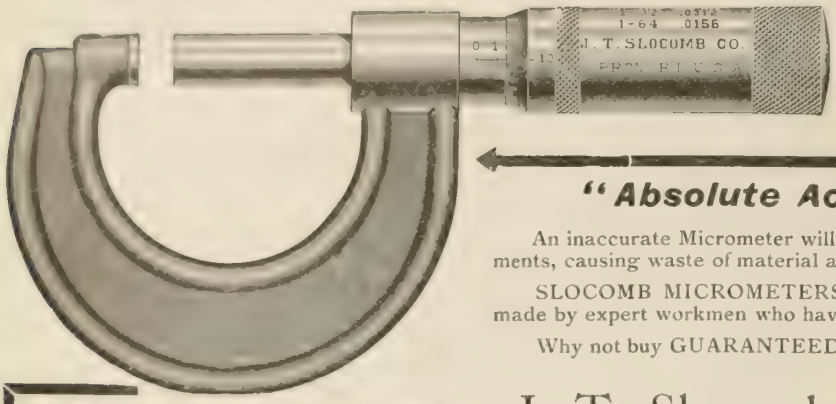


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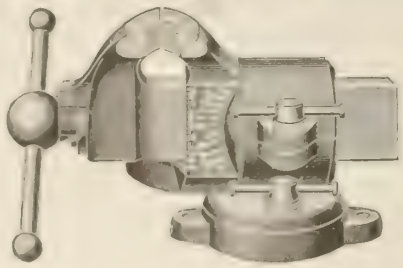
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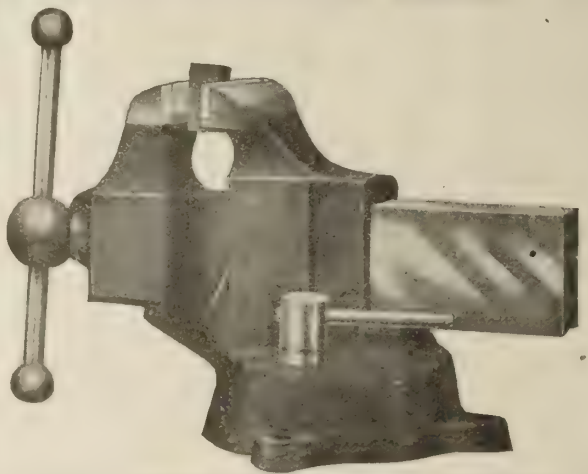
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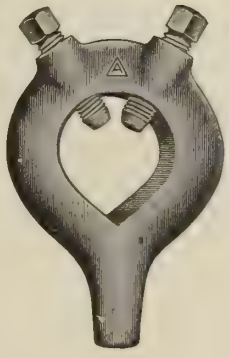
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One 12x15 in. L.H. Tangye Bed Side Slide Valve	60
One 10"x14 in. R.H. Box Bed Side Slide Valve	40
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One 14x18 in. Center Crank Slide Valve..	70
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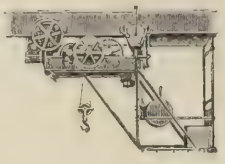
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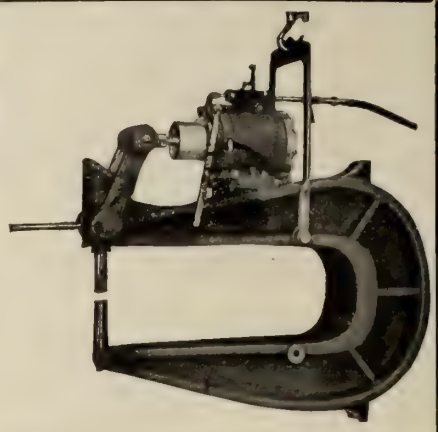
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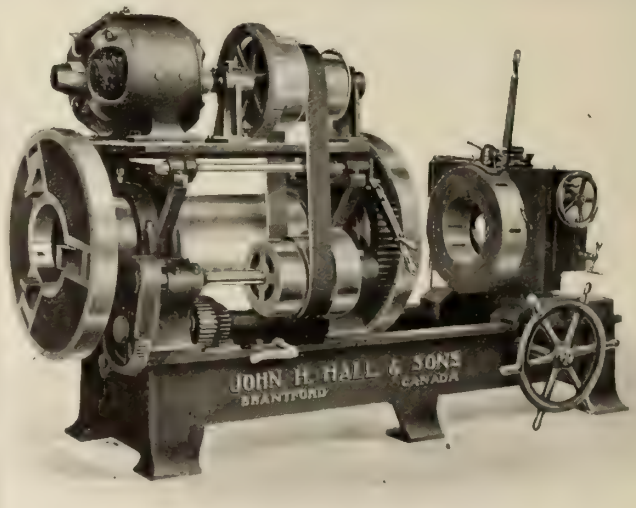
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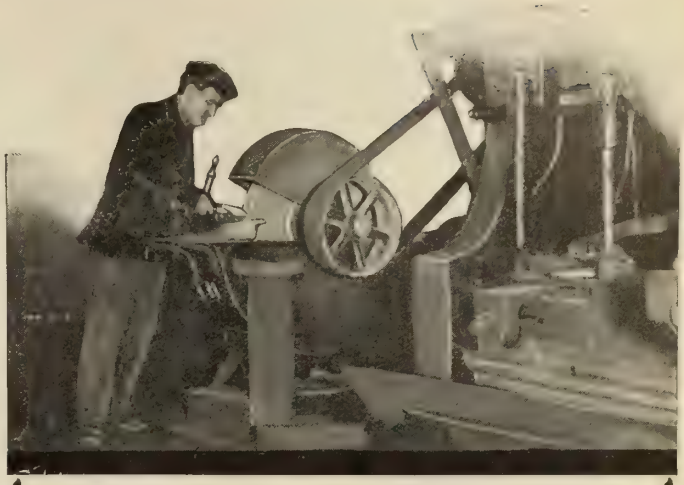
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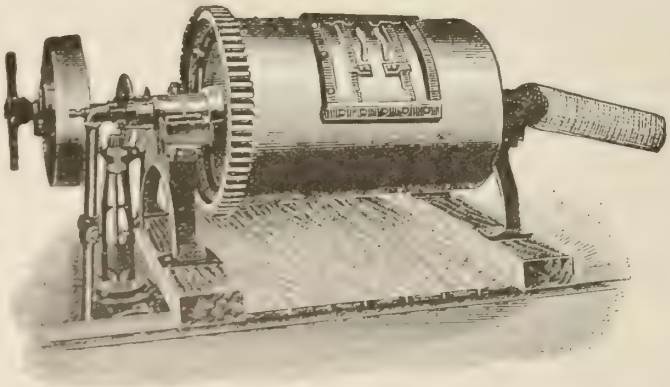
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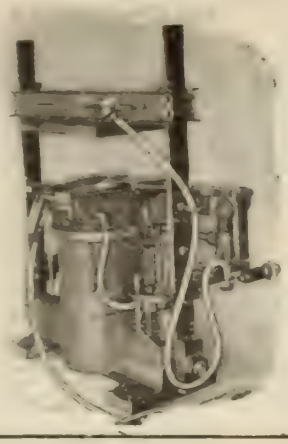
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This is Foundry Economy; Flour, Rosin, etc., are now luxuries.

A barrel of King Kore Kompound will be sent "subject to approval" to any inquiring mind.

That is the **Stevens' System** of trying before buying.

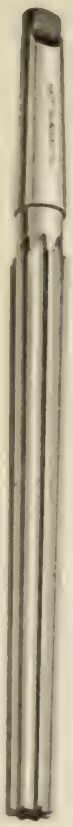
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The stamp of quality pervades them all.

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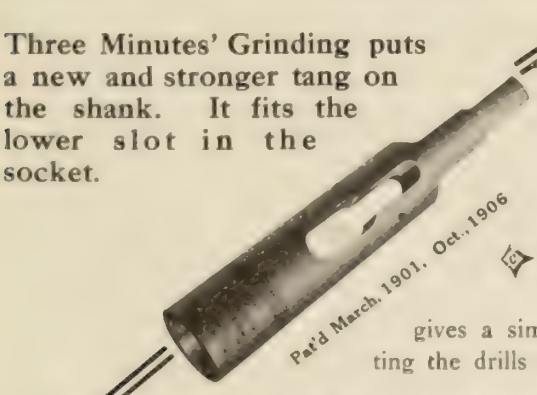
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Three Minutes' Grinding puts a new and stronger tang on the shank. It fits the lower slot in the socket.



What Do Your Twisted-Off Tangs Cost?

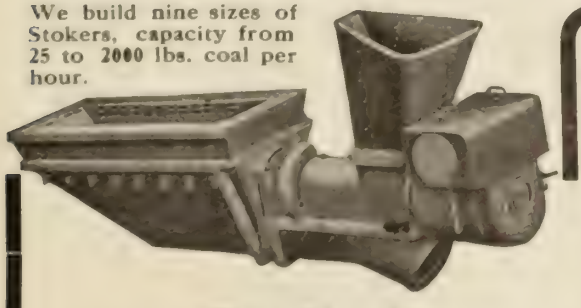
Keep account for a time of the new drills used to replace those thrown into the scrap heap because of twisted-off tangs, and you will see. These scrapped drills are all right in every other respect.

The "PERFECT" Double-Tang Socket

gives a simple, effective, and inexpensive means of eliminating this cost and putting the drills back in money-earning shape. **Write for Folder A.**

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Write Now!

Our Furnaces Heat Steel with the Cheapest Fuel on Earth—

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They are all fired with "American" Mechanical Stokers, which burn bituminous slack coal automatically and without smoke, and give a clear, steady, soft, non-scaling flame. You get increased production, at about one-third to one-half the operating cost of oil or hard coal. This is a fact. If you burn money to heat steel why not burn less of it, and write us at once?

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CANADIAN MACHINERY BUYERS' DIRECTORY

To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

To Our Advertisers—Send in your name for insertion under the heading of the lines you make or sell.

To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

Abrasive Materials.

Rupert G. Bruce Co , Ltd , Toronto
The Canadian Fairbanks Co., Montreal.
Canadian Hart Wheels Ltd., Hamiltou.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Toronto
Foss & Hill Machinery Co., Montreal
Stevens, F. B., Detroit, Mich.

Air Propellers.

Matthews & Yates, Manchester, Eng.

Air Receivers.

Canadian Rand Co., Montreal.
Holden Co. Montreal
Mussens, Limited, Montreal

Aluminum.

Parke & Leith, Toronto
Tallman Brass & Metal Co., Hamilton

Arbors.

The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O.
Standard Tool Co., Cleveland, O

Arbor Presses.

Niles-Bement-Pond Co., New York.

Automatic Chucks.

Garvin Machine Co., New York

Automatic Index Milling Machines.

Canadian Yeates Gordon Co., Hamilton
Garvin Machine Co., New York

Automatic Machinery.

Canadian Yeates Gordon Co., Hamilton
Gardner, Robt. & Son, Montreal
Mussens Limited, Montreal.

Automobile Rims

Standard Welding Co., Cleveland, O.

Axle Cutters.

Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Babbit Metal.

Canada Metal Co., Toronto.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
Lumen Bearing Co., Toronto.
Magnolia Metal Co.. New York
Tallman Brass & Metal Co., Hamilton

Ball Bearings

Chapman Double Ball Bearing Company, Toronto
John Millen & Son, Ltd., Montreal

Balls, Steel.

Hermann Boker & Co., Montreal
John Millen & Son, Montreal

Barrels, Steel Shop.

Cleveland Wire Spring Co., Cleveland.

Bars, Boring.

Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Belting, Chain.

The Canadian Fairbanks Co., Montreal
Jones & Glassco, Montreal
John Millen & Son, Montreal
Waterous Engine Works Co., Brantford.

Belting, Cotton.

Dominion Belting Co., Hamilton.
Foss & Hill Machinery Co., Montreal

Belting, Leather.

Canadian Yeates Gordon Co., Hamilton
The Canadian Fairbanks Co., Montreal.
J. L. Goodhue & Co., Danville, P.Q.
Imperial Waste & Metal Co., Montreal
McLaren, J. C., Montreal.
Sadler & Haworth, Montreal

Bending Machinery.

John Bertram & Sons Co., Dundas, Ont.
Bertrams Limited, Edinburgh, Scotland
Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Yeates Gordon Co., Hamilton
Jardine, A. B. & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Long & Alstatter Co., Hamilton, O
Mussens, Limited, Montreal
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Boilers.

Canadian General & Shoe Machinery Co., Levis, Que.
Canadian Yeates Gordon Co., Hamilton
Goldie & McCulloch Co., Galt.
The John Inglis Co., Ltd., Toronto
Mussens Limited, Montreal.
Owen Sound Iron Works Co., Owen Sound.
Robb Engineering Co., Amherst, N.
Scotia Eng. Company, Montreal
Standard Engineering, Co., Toronto.
Waterous Engine Works Co., Brantford.

Boiler Compounds.

Hall Engineering Works, Montreal.

Boiler Feed Regulators.

Standard Engineering Co., Toronto.

Boiler Makers' Supplies.

Jno. F. Allen Co., New York

Boiler Mountings.

Standard Engineering Co., Toronto.

Boiler Settings.

Harbison-Walker Refractories Co., Pittsburg

Bolt and Nut Machinery.

John Bertram & Sons Co., Dundas, Ont.
Canadian Yeates Gordon Co., Hamilton
Foss & Hill Machinery Co , Montreal
Gardner Robt. & Son, Montreal
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.

Boring Machines, Upright.

John Bertram & Sons Co., Dundas, Ont.
Canadian Yeates Gordon Co., Hamilton
Foss & Hill Machinery Co., Montreal
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Boring Machines, Wood.

The Canadian Fairbanks Co., Montreal
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.

Boring and Turning Mills.

John Bertram & Sons Co., Dundas, Ont.
Bullard Machine Tool Co., Bridgeport, Conn
Canadian Yeates Gordon Co., Hamilton
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Box Puller.

A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.

Cleveland Wire Spring Co., Cleveland.
Francis Hyde & Co., Montreal.

Boxes, Tote.

Cleveland Wire Spring Co., Cleveland.
Francis Hyde & Co., Montreal.

Brake Shoes

Montreal Steel Works, Montreal

Brass Working Machinery.

Canadian Yeates Gordon Co., Hamilton
Gardner, Robt., & Son Montreal
Mussens Limited Montreal.
Warner & Swasey Co., Cleveland, Ohio.

Brazing Compounds.

Phillips-Laffitte Co., Philadelphia

Buckets, Clam Shell & Grab

Browning Engineering Co., Cleveland, O.
Whiting Foundry Equipment Company, Harvey, Ill.

Bulldozers.

John Bertram & Sons Co., Dundas, Ont.
Canadian Yeates Gordon Co., Hamilton
Foss & Hill Machinery Co., Montreal
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.

Burners, Fuel Oil and Natural Gas.

Rupert G. Bruce Co., Ltd., Toronto
Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York
Whiting Foundry Equipment Co., Harvey, Ill.

Burrs, Iron and Copper.

Parmenter & Bullock Co., Gananoque

Calipers.

Schuchardt & Schutte, New York

Canners' Machinery.

Bliss, E. W., Co., Brooklyn, N.Y
Canadian Yeates Gordon Co., Hamilton

Car Replacers

Montreal Steel Works, Montreal
Mussens, Limited, Montreal

Car Wheels, Mine

Montreal Steel Works, Montreal

Cars, Industrial.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Francis Hyde & Co., Montreal.
Mussens Limited. Montreal.
Sheldons, Limited, Galt
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.

Lumen Bearing Co., Toronto
Tallman Brass & Metal Co., Hamilton

Castings, Brass.

Hall Engineering Works, Montreal.
Lumen Bearing Co., Toronto
Owen Sound Iron Works Co., Owen Sound.
Tallman Brass & Metal Co., Hamilton
Waterous Engine Works Co. Brantford

Castings, Grey Iron.

Gardner, Robt. & Son, Montreal
Hall Engineering Works, Montreal.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Works Co., Brantfor

Castings, Steel and Manganese Steel.

Montreal Steel Works, Montreal

Castings, Malleable.

Galt Malleable Iron Co., Galt
Pratt & Letchworth, Brantford
Smiths Falls Malleable Castings Co., Smiths Falls

Castings, Phosphor Bronze.

Lumen Bearing Co., Toronto

Cement, Iron

Shelton Metallic Filler Co., Derby, Conn

Cement Machinery.

The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound.
Waterous Engine Works Co., Brantford

Centering Machines

John Bertram & Sons Co., Dundas, Ont
Canadian Yeates Gordon Co., Hamilton
Foss & Hill Machinery Co., Montreal
Gardner, Robt. & Son, Montreal
London Mach Tool Co., Hamilton, Ont.
Mussens, Limited, Montreal
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.

The John Inglis Co., Ltd., Toronto
Pratt & Whitney Co , Hartford, Conn.
Waterous Engine Works Co., Brantford.

Chain Blocks.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
John Millen & Son, Montreal
Mussens Limited, Montreal.
Schuchardt & Schutte, New York

Chucks, Drill, Lathe and Universal.

John Bertram & Sons Co., Dundas, Ont.
Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn
Foss & Hill Machinery Co., Montreal
Gardner, Robt. & Son, Montreal
S. E. Horton Machine Co., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York
Standard Tool Co., Cleveland, O
Stevens Co., Galt, Ont.
Union Mfg. Co., New Britain, Conn.

Chucking Machines.

The Garvin Machine Co., New York
Niles-Bement-Pond Co., New York.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.

Canadian Westinghouse Co., Hamilton.

Cloth and Wool Dryers.

Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Clutches.

Positive Clutch & Pulley Works, Toronto

Coal Boring and Cutting Machines.

Canadian Rand Co., Montreal

Coal Handling Machinery.

Browning Engineering Co., Cleveland, O.
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford

Collectors, Pneumatic.

Sheldons Limited, Galt

Collets, Milling Machine.

The National Tool Co., Cleveland, O.

Compressors, Air.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Canadian Yeates Gordon Co., Hamilton
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

Concentrating Plant.

Gardner, Robt. & Son, Montreal

Concrete Mixers.

The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Foss & Hill Machinery Co., Montreal
Mussens, Limited, Montreal

Concrete, Reinforcement

Canada Wire Goods Mfg. Co., Hamilton

Condensers.

Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal
The John Inglis Co., Ltd., Toronto
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

Consulting Engineers.

Hall Engineering Works, Montreal.
Robertson, J. M., Ltd., Montreal
Standard Engineering Co., Toronto

Controllers and Starters Electric Motor.

Canadian Westinghouse Co. Hamilton
T. & H. Electric Co. Hamilton

Conveyor Machinery.

The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Foss & Hill Machinery Co., Montreal
Goldie & McCulloch Co., Galt
Mussens Limited, Montreal
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford

Coping Machines.

John Bertram & Sons Co., Dundas, Ont.
Canadian Yeates Gordon Co., Hamilton
Leslie Machine Tool Co., Hamilton
Niles-Bement-Pond Co., New York

Counterbores and Countersinks.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O
Standard Tool Co., Cleveland, O

Couplings.

Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound

Couplings, Air.

Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago

Cranes, Locomotive.

Browning Engineering Co., Cleveland, O
Mussens Limited, Montreal

Cranes, Traveling, Electric and Hand Power.

Advance Machine Works, Walkerville, Ontario
Mussens Limited, Montreal
Northern Eng. Works, Detroit, U.S.A.

Cranes, Wrecking.

Browning Engineering Co., Cleveland

Crank Pin Turning Machine.

London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crossings, Diamond Rail

Montreal Steel Works, Montreal

Crushers, Rock or Ore.

Foss & Hill Machinery Co., Montreal
Mussens, Limited, Montreal
Waterous Engine Works Co., Brantford.

Cutters, Flue.

Independent Pneumatic Tool Co., Chicago, Ill.

Cutters, Pipe.

The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Tolhurst Mfg. Co., Roxbury, Mass.

Cutter Grinders and Attachments.

Cincinnati Milling Machine Co., Cincinnati
Garvin Machine Co., New York
Modern Tool Co., Erie, Pa.
Mussens Limited, Montreal

Cutters, Milling.

Becker Milling Machine Co., Hyde Park, Mass.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal
National Tool Co., Cleveland, O
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
L. S. Starrett Co., Athol, Mass.

Cutting-off Machines.

Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Garvin Machine Co., New York
Leslie Mach. Tool Co., Hamilton
Mussens Limited, Montreal
National Tool Co., Cleveland, O
Pratt & Whitney Co., Hartford, Conn.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.

The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal
Standard Engineering Co., Toronto

Dies and Die Stocks

Armstrong Bros., Toronto
Banfield, W. H. & Sons, Toronto
Bliss, E. W. Co., Brooklyn, N.Y.
Foss & Hill Machinery Co., Montreal
Gardner, Robt. & Son, Montreal
Jardine, A. B. & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford
Pedlar Machine Co., St. Catharines, Ont.
Ernest Scott, Montreal

Die Castings.

Taunton Brass & Metal Co., Hamilton

Die Linkers.

Garvin Machine Co., New York

Dies, Self-opening.

Geometric Tool Co., New Haven, Conn.

Dies, Opening.

W. H. Banfield & Sons, Toronto
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford, Conn.

Draft, Mechanical.

W. H. Banfield & Sons, Toronto.
Rattenbeal & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt

Drawing Tables

R. E. Kaddel

Dredging Machinery.

Browning Engineering Co., Cleveland
Mussens, Limited, Montreal

Drill Presses.

Garvin Machine Co., New York
Mussens, Limited, Montreal

Drilling Machines, Locomotive and Multiple Spindle.

John Bertram & Sons Co., Dundas, Ont.
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton, Ont.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Mueller Machine Tool Co., Cincinnati, O
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.

John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
London Mach. Tool Co., Hamilton.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Sensitive.

H. G. Barr, Worcester, Mass.
Mussens, Limited Montreal
Niles-Bement-Pond Co., New York

Drilling Machines, Upright and Horizontal.

John Bertram & Sons Co., Dundas, Ont
Foss & Hill Machinery Co., Montreal
Gem Mfg. Co., Pittsburg, Pa
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
R. McDougall Co., Galt
Niles-Bement-Pond Co., New York

Drills, Bench.

London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.
United States Electrical Tool Co., Cincinnati

Drills, Blacksmith and Bit Stock.

Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
L. S. Starrett Co., Athol, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Coal and Plaster.

Canadian Rand Co., Montreal
Cummings, J. W., New Glasgow, N.S.

Drills, Electric and Portable.

Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
United States Electrical Tool Co., Cincinnati

Drills, High Speed.

W. F. & John Barnes Co., Rockford, Ill.
Hermann Boker & Co., Montreal
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb, Montreal
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal
Pratt & Whitney Co., Hartford, Conn.
Seneca Machine Tool Co., South Pend, Ind.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Drills, Oil Tube.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Pneumatic.

John F. Allen Co., New York
Canadian Rand Co., Montreal
Holden Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.

Armstrong Bros. Tool Co., Chicago.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Chas. Parker & Co., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Rock.

Canadian Rand Co., Montreal.
Mussens, Limited, Montreal

Drills, Track.

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Twist.

The Canadian Fairbanks Co., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Morse Twist Drill and Machine Co. New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drill Sockets.

Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Dry Kiln Cars and Equipment.

Sheldons Limited, Galt

Dump Cars.

Rupert G. Bruce Co., Ltd., Toronto
Browning Engineering Co., Cleveland
The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.
Mussens Limited, Montreal
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dynamos and Electrical Supplies.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.
Federal Eng. & Supplies, Ltd., Toronto
Hall Engineering Works, Montreal, Que.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

Electric Welding

Standard Welding Co., Cleveland, O.

Elevators and Buckets.

Francis Hyde & Co., Montreal.
Waterous Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery and Emery Wheels.

Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton.
Garvin Machine Co., New York
Foss & Hill Machinery Co., Montreal
Francis Hyde & Co., Montreal
Mussens, Limited, Montreal
Pittsburg Emery Wheel Co., Pittsburg, Pa
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.

Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Canadian Yeates Gordon Co., Hamilton
Gardner, Robt. & Son, Montreal
Francis Hyde & Co., Montreal.
Mussens, Limited, Montreal

Engineers, Marine and Mechanical.

Canadian General & Shoe Machinery Co. Levis, Que.

Engines, Marine.

John Inglis Co., Ltd., Toronto
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engineers' Supplies.

Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.

The Canadian Fairbanks Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Fielding & Platt, Ltd., Gloucester, Eng.
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engines, Steam.

Canadian Yeates Gordon Co., Hamilton
The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst, N.S.
Scotia Eng. Co., Montreal
Sheldons Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Equipment, Shop.

Garvin Machine Co., New York

Escutcheon Pins.

Parmenter & Bulloch Co. Gananoque

Exhaust Heads.

The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.

Canadian Westinghouse Co., Hamilton
Foss & Hill Machinery Co., Montreal
Matthews & Yates, Manchester Eng.
Sheldons Limited Galt, Ont.
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.

The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford.

Files.

Nicholson File Co., Port Hope, Ont.
Simonds Mfg. Co., Fitchburg, Mass.

Flanges.

Dart Union Co., Ltd., Toronto

Forges.

Canadian Yeates Gordon Co., Hamilton
Francis Hyde & Co., Montreal.
Independent Pneumatic Tool Co. Chicago, Ill.
W. S. Rockwell Co., New York
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.

Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York

Forgings, Drop, Automobile and Locomotive

Bliss, E. W., Co., Brooklyn N.Y.
Canadian Billings & Spencer, Ltd., Welland.

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co., Toronto

Friction Clutch Pulleys, etc

The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs

Montreal Steel Works, Montreal

Furnaces, Steel Heating.

Standard Engineering Co., Toronto
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Sheldons Limited, Galt.

Gas Producer Linings.

Harbison-Walker Refractories Co., Pittsburg

Gas Producer Plants.

The Canadian Fairbanks Co., Montreal
Fielding & Platt, Ltd., Gloucester, Eng

Gauges, Standard.

The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn

"Let us know what you want," "That's All"

SANDS

Albany Moulding
Jersey Moulding
Strong Silica
Bottoming Sand
Jersey Fire Sand
Edgar Silica Fire Sand
Millville Gravel, Etc.

PLUMBAGO

Facings
Core Compound
Glutrin
Parting
Core Wash
Fire Brick and Clay
Cupola Blocks, Etc.

FURNACES

for melting Bronze, Brass, Aluminum, Annealing, Tempering, Bolt Forging, Steam Hammer, Case Hardening, Rivet Heating, Bulldozer, Reverberatory, Etc., Etc.
We build Furnaces for all Requirements.

N.B.—We Manufacture: Cupolas, Tumbling Mills, Cranes, Ladles, Turntables, Cars, Etc.

F. HYDE & COMPANY

Manufacturers Foundry Equipment and Supplies.

31 Wellington St. - - - Montreal

Gear-Cutting Machinery.

The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
Canadian Yeates Gordon Co., Hamilton
Garvin Machine Co., New York
London Mach. Tool Co., Hamilton
Mussens, Limited, Montreal
Morse Twist Drill and Machine Co., New Bedford
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Hartford, Conn
Schuchardt & Schutte, New York

Gears, Cut, Mortise, Angle, Worm.

Armstrong Bros., Toronto
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont
Hamilton Gear & Machine Co., Toronto
John Millen & Son, Montreal
New Process Raw Hide Co., Syracuse
Waterous Engine Works Co., Brantford

Gears, Rawhide.

Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont
John Millen & Son, Montreal
New Process Raw Hide Co., Syracuse
Waterous Engine Works Co., Brantford

Generators, Electric.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton
Hall Engineering Works, Montreal
Lancashire Dynamo and Motor Co., Ltd., Toronto
Toronto & Hamilton Electric Co., Hamilton

Grates, Shaking and Dumping

Standard Engineering Co., Toronto

Graphite.

Rupert G. Bruce Co., Ltd., Toronto
Joseph Dixon Crucible Co., Jersey City
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal
John Millen & Son, Montreal
Stevens, F. B., Detroit, Mich.

Grease Cups.

Peterboro Lubricator Mfg. Co., Peterboro

Grinders, Automatic Knife.

Canadian Hart Wheels Ltd., Hamilton
W. H. Banfield & Son, Toronto
Waterous Engine Works Co., Brantford.

Grinders, Centre, Pedestal and Bench.

Canadian Hart Wheels Ltd., Hamilton
Geo. Mfg. Co., Plattsburg, Pa
Niles-Bement-Pond Co., New York.
United States Expt. Tool Co., Cincinnati
Morse Twist Drill and Machine Co., New Bedford

Grinders, Cutter.

Barnes Drill Co., Fitchburg, Mass
Modern Tool Co., Erie, Pa
Mussens, Limited, Montreal
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York
Smart-Turner Mach. Co.

Grinders, Disc.

Armstrong Bros., Chicago
Barnes Drill Co., Fitchburg, Mass
Mussens, Limited, Montreal
Vaughan Machine Works, Grand Rapids

Grinders, Drill.

Garvin Machine Co., New York
Mussens, Limited, Montreal

Grinders, Portable Electric, Hand, Tool, Post and Bench

Mussens, Limited, Montreal
Lunkenheimer Brass Mfg. Co., Cincinnati

Grinders, Tool and Holders.

Armstrong Bros. Tool Co., Chicago
W. H. Banfield & Sons, Hartford, Ill
Barnes Drill Co., Fitchburg, Mass
Blount, J. G., & Co., Everett, Mass.

Grinding and Polishing Machines, Portable, Pneumatic and Spring Frame.

Barnes Drill Co., Fitchburg, Mass
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton
Doty Engine Works Ltd., Toronto
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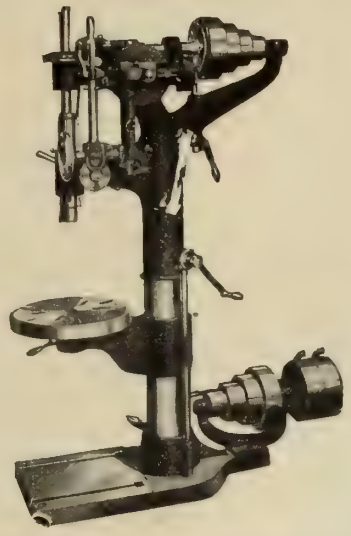
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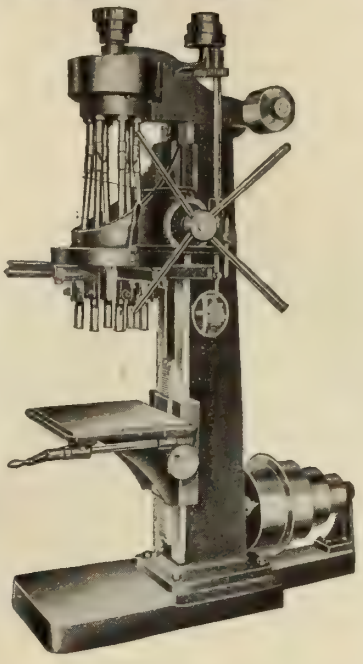
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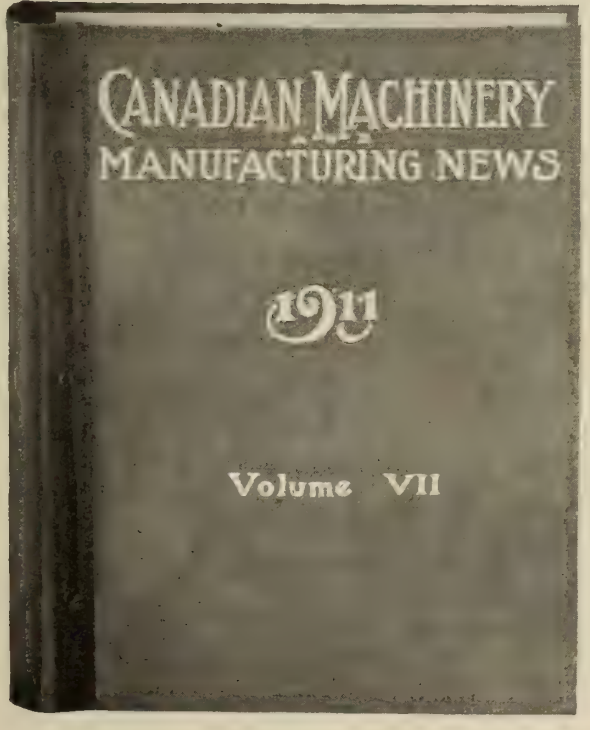
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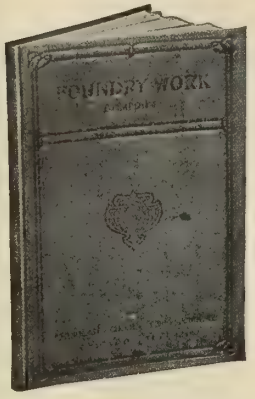
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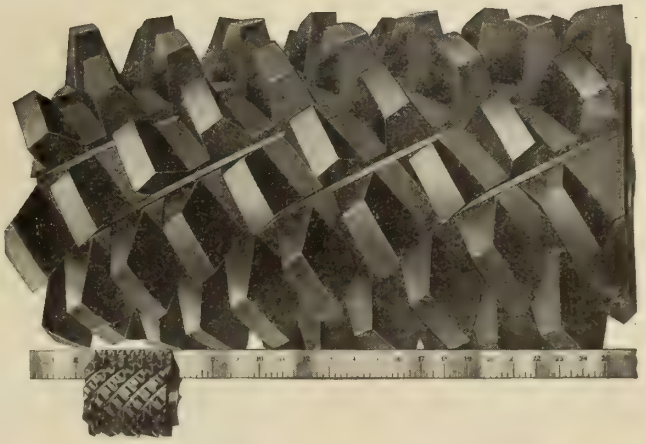
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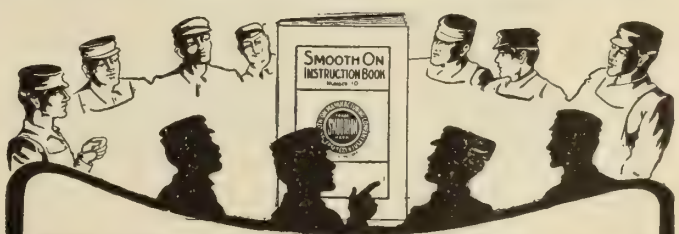
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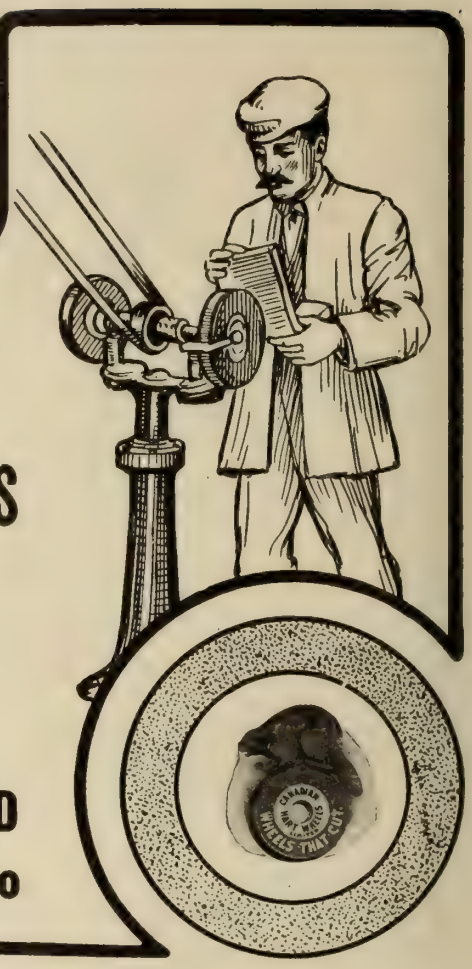
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Hamilton, - - - - Ontario

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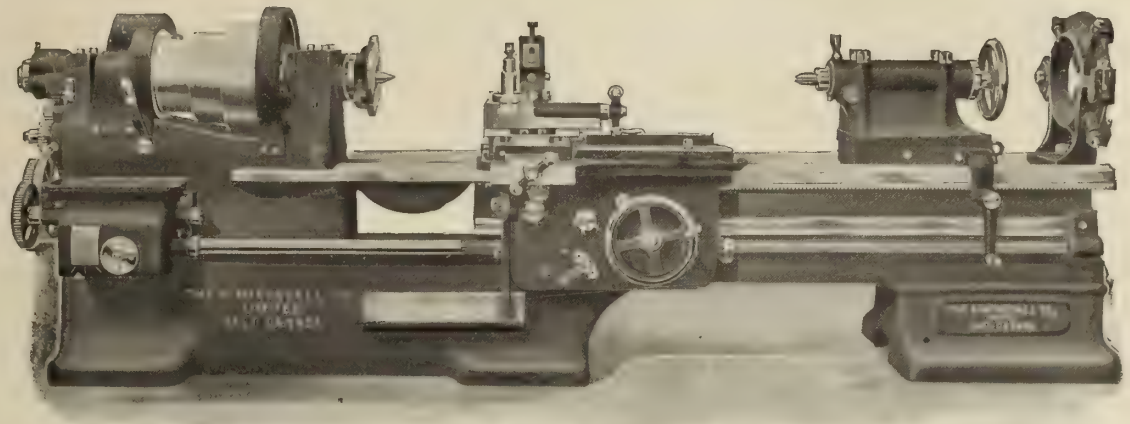
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The advertiser would like to know where you saw his advertisement—tell him.

Why Don't You "Get Acquainted" with this New Gap Lathe?



WE know it will pay you to find out ALL about it. There are many features which make it not only the most perfect gap lathe, but also the fastest in operation and adjustment. In fact, it exactly fills a long-felt want, and fills it so well that we are having difficulty in filling orders. We solicit correspondence in regard to it, as we know how good it is, and feel that if you also knew you would not be without it under any circumstances. These are some of the main points:—

Headstock construction prevents chattering, and deep oil chambers fitted with ring oilers make spindles and bearings self-oiling and always well lubricated.

Tailstock of a special type, and sleeve is clamped by a quick acting locking device. Tailstock is secured to bed by bolts adjusted from the top where they are easily accessible.

Bed, non-springing and webbed, and braced to secure rigidity.

Gap, vibration absolutely prevented by use of brace supports to carriage.

Spindle, high carbon hammered steel in solid chilled cast iron bearings, accurately fitted and self oiling.

Carriage and Apron, non-springing under severest strain, full "V" bearings and flat bearings in addition on front ways.

Double Back Gears give eighteen distinct spindle speeds, suiting lathe to work on widely different diameters

Compound Rest, with graduated base, accurately fitted taper gibs, end adjusted. Screws in both rest and cross slide read to thousandths.

Friction, Safety Feeds, screw and rod feeds cannot be both engaged at the same time. Quick changes of 1¼, 2½ and 5 times thread being cut.

Gears and Racks, cut from solid and steel where necessary.

Screw Cutting, full range of commercial threads provided for.

Equipment, Compound rest, steady rest, follow rest, large and small face plates, wrenches, two-speed, friction countershaft furnished with each lathe.

Accuracy, Strength, Solidity, Wear. These are the paramount features behind all McDougall Machines. Made **to meet extreme demands.**

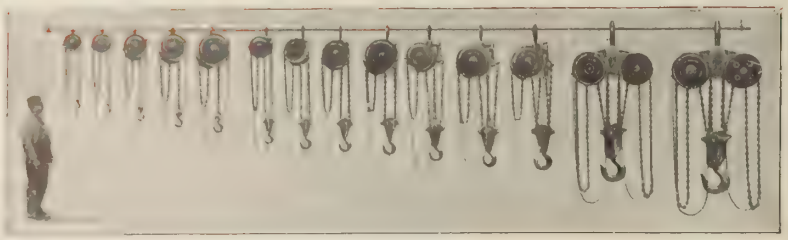
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The R. McDougall Co., Ltd.

GALT, ONTARIO

Canadian Fairbanks Company, Sales Agents **Cable Address: Dougalt, A.B.C. 5th edition**

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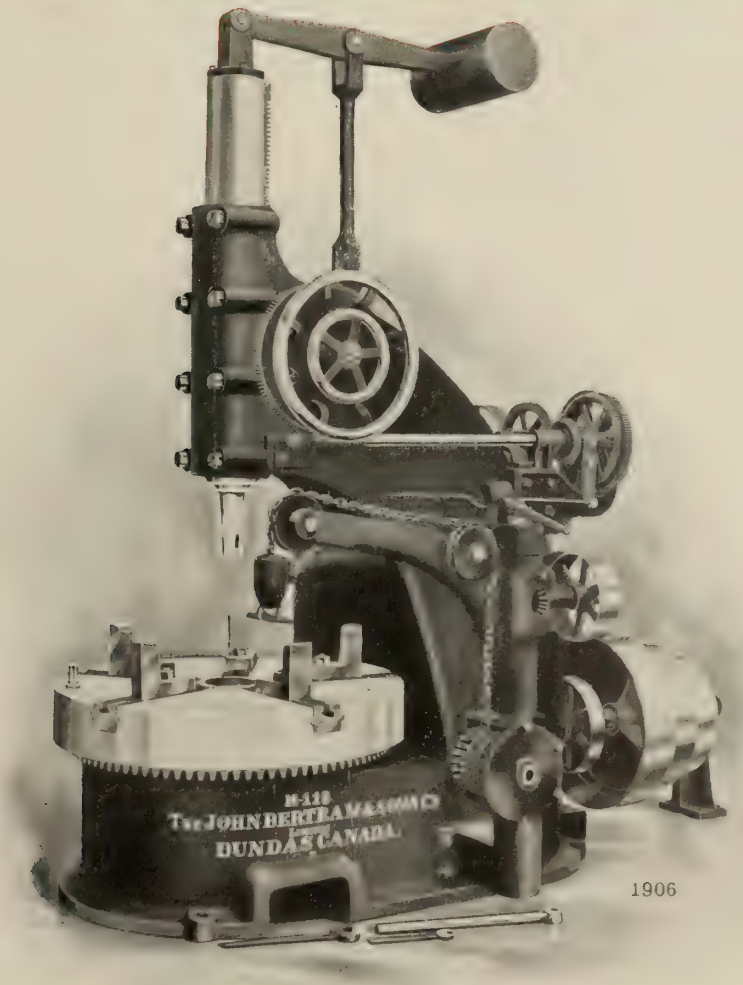
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A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

MONTREAL, Eastern Townships Bank Bldg. TORONTO, 143-149 University Ave. WINNIPEG, 34 Royal Bank Building. LONDON, ENG., 88 Fleet Street, E C

Vol. VII. Publication Office: Toronto, July, 1911. No. 7

RAILWAY SHOP MACHINERY



BERTRAM 42-Inch CAR WHEEL BORING MACHINE

with Five Gripping Jaws in Table, Power Crane and Power Hub Facing Attachment.

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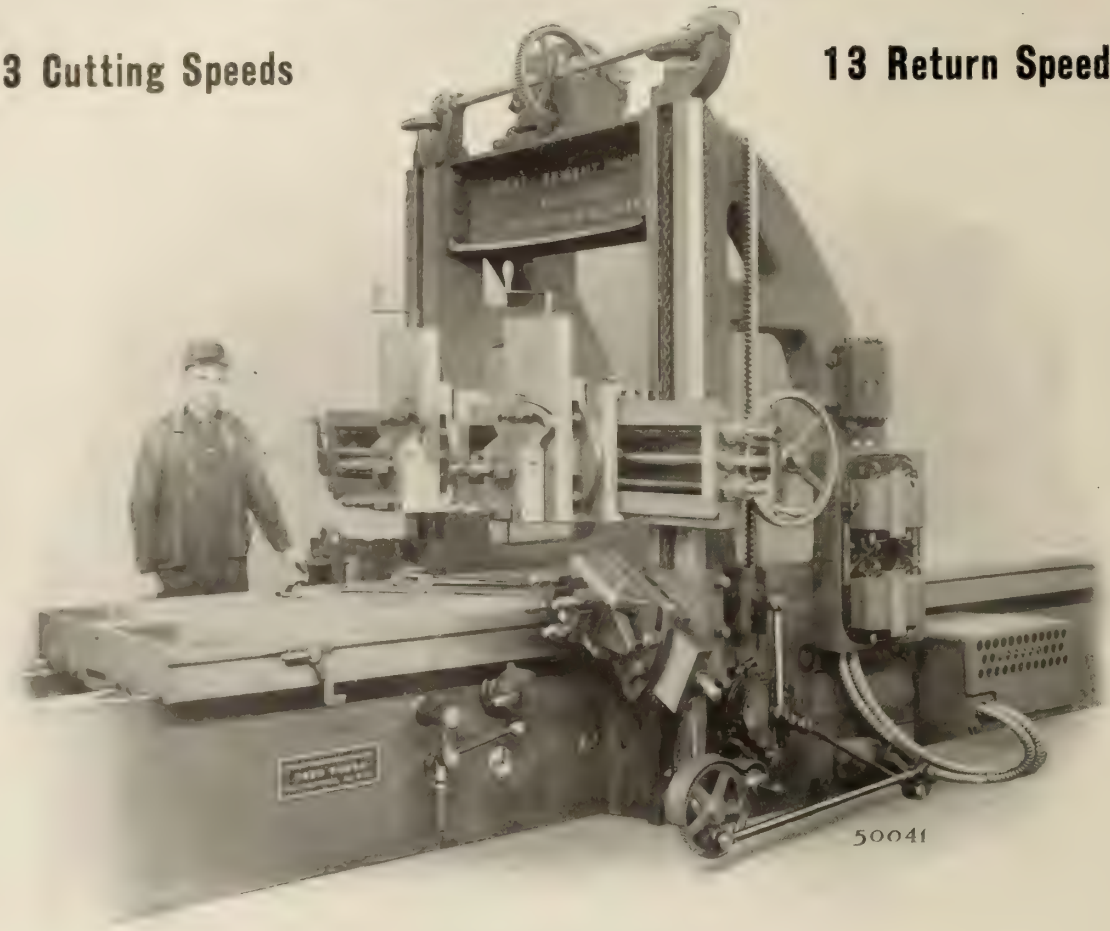
No Clutches, Shifting Belts or Gear Boxes

ON THE

POND REVERSING MOTOR PLANER

With Pond Patent Planer Control

13 Cutting Speeds **13 Return Speeds**



Pond 48 inch Reversing Motor Planer

The Reversing Motor is connected directly to the driving shaft---enabling the full power of the drive to be transmitted without loss to the table. The elimination of all slipping between motor and table gives an accuracy of stroke heretofore unattainable.

The Motor responds instantly to all speed changes which may be made while table is running at any part of stroke. This sensitiveness facilitates setting of work and tool.

The Pilot Switch, in itself, gives a slow speed irrespective of the position of the speed regulators on the controller, thus permitting the operator to slow down for hard spots or extra heavy cuts---returning immediately to the regular speed.

Variation of speed alone will show economy---the convenience, simplicity and perfect control of the speeds on the Pond Reversing Motor Planer increase that economy considerably.

Write for four-page folder "Pond Reversing Motor Planers"

Niles-Bement-Pond Co.

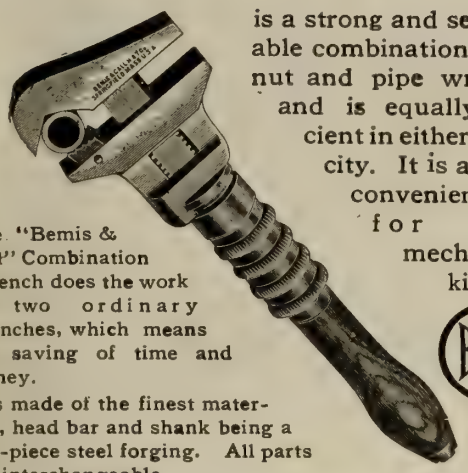
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THE CANADIAN FAIRBANKS CO.

MONTREAL TORONTO VANCOUVER WINNIPEG ST. JOHN CALGARY

"Bemis & Call" Combination Wrench



is a strong and serviceable combination of a nut and pipe wrench, and is equally efficient in either capacity. It is a most convenient tool for any mechanic's kit.

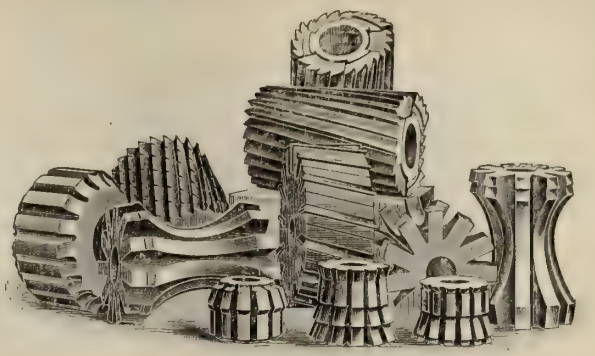
The "Bemis & Call" Combination Wrench does the work of two ordinary wrenches, which means the saving of time and money.

It is made of the finest materials, head bar and shank being a one-piece steel forging. All parts are interchangeable.

TRADE B&C MARK

Service is guaranteed—write for complete catalogue of wrenches

Bemis & Call Hardware and Tool Co.
SPRINGFIELD, MASS., U.S.A.



STANDARD TOOL CO.

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on milling cutters. We furnish regular and special cutters of carbon and high speed steel for all purposes, and give you better value and service than you can get elsewhere. The "Shield Brand" on cutters is our guarantee and your protection. Order "Shield Brand" cutters.

THE STANDARD TOOL CO.
Cleveland, - - Ohio, U.S.A.

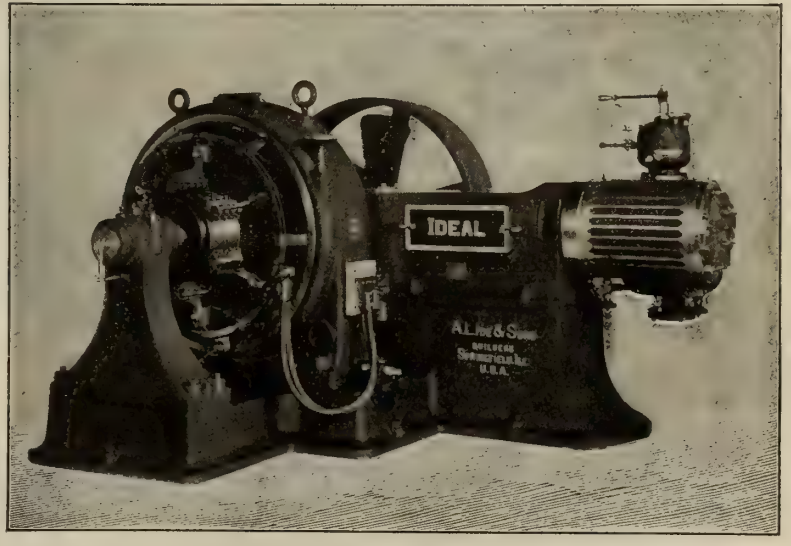
Westinghouse

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High Efficiency

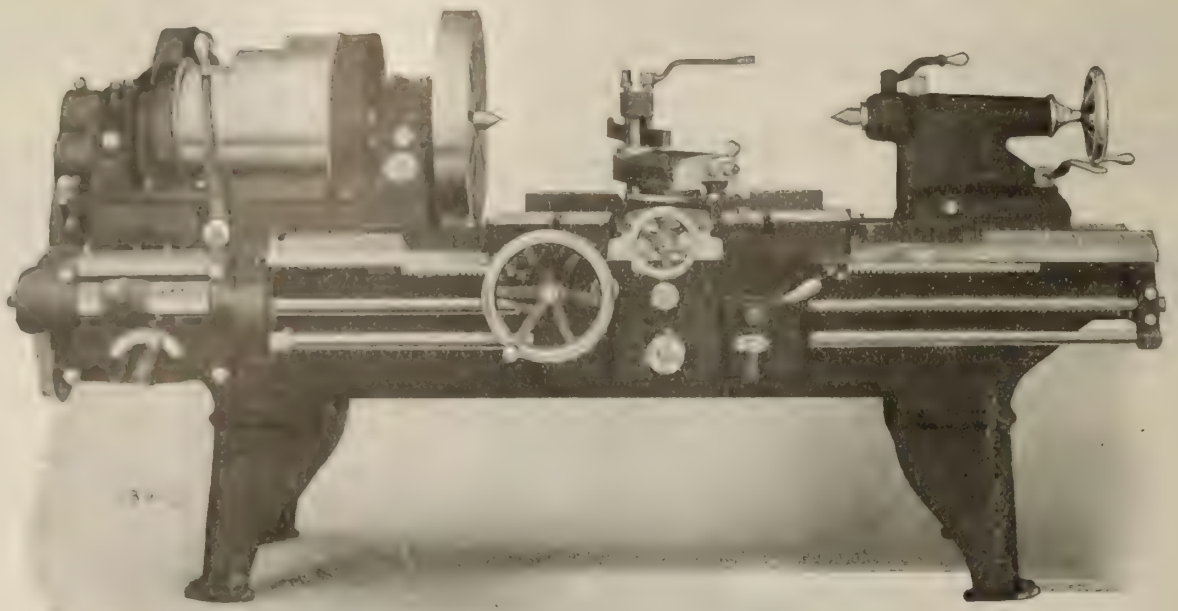
Low Maintenance

Cool Operation



Canadian Westinghouse Co., Limited, Hamilton, Ontario

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Cost Reducing Features

An indestructible spindle bearing made of hardened steel and cast iron.

A head construction that gives more effective pulling power at the spindle than any other lathe built.

A patent "oompensating V" that permits four times the bearing area between the carriage and bed found on other lathes.

A carriage in which the tool thrust is taken on a bearing the entire length of the carriage, and which positively will not climb the V.

A double-walled one-piece apron which will last as long as the rest of the lathe.

A quick change gear complete in one unit, giving thirty-six changes with two operating levers.

An offset compound rest which can be used without skinning the operator's knuckles.

The centres set back of the middle of the bed, giving greater swing over carriage and permitting the turning of work up to the maximum swing without the tool overhanging the bed.

WRITE US FOR INTERESTING DETAILS.

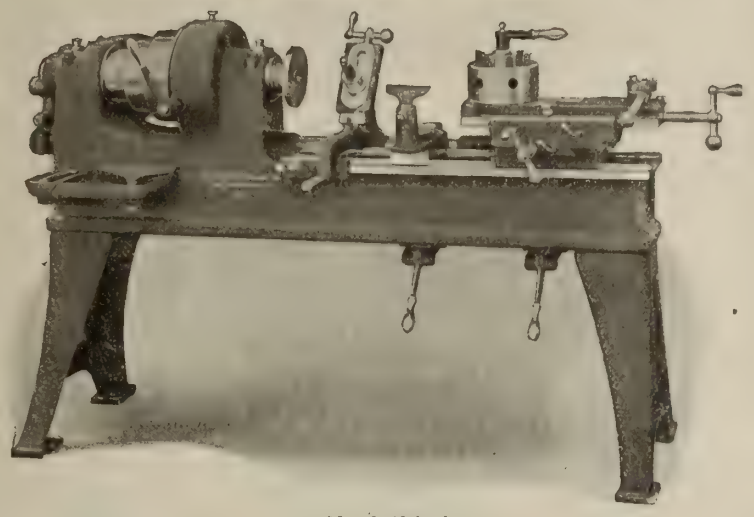
The London Machine Tool Co., Limited

HAMILTON, CANADA

Eastern Agents: Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que.

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UNIVERSAL TURRET LATHES



No. 3, 18 inch

Universal Turret Lathes. Three sizes—16 in. 18 in., and 24 in.

These are excellent machines for general use, and for jobbing and repair work. They are rigidly constructed and the design and detail have been worked out to satisfy the most critical user.

They are adapted for a great variety of work, and large and small lots, and are capable of handling it rapidly.

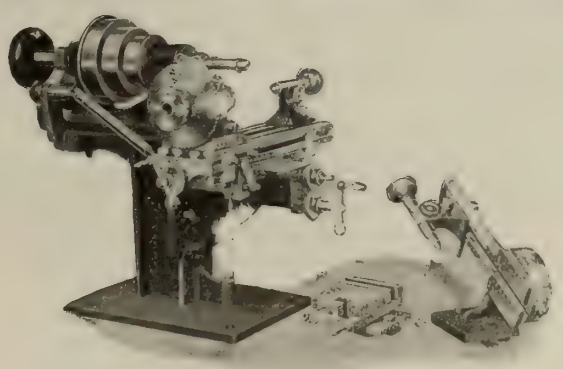
Send samples or blue prints and let our Engineering Department estimate on the output.

Hollow Hexagon Turret Lathes. Turret Screw Machines. Brass-working Machine Tools.

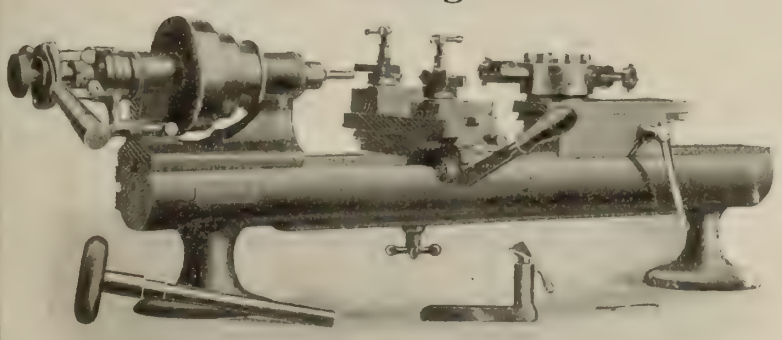
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CLEVELAND, OHIO, U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams and Wilson, Montreal



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will do work which cannot be handled on Standard Large Milling Machines, and will do some of the work now being done at a loss on large machines.

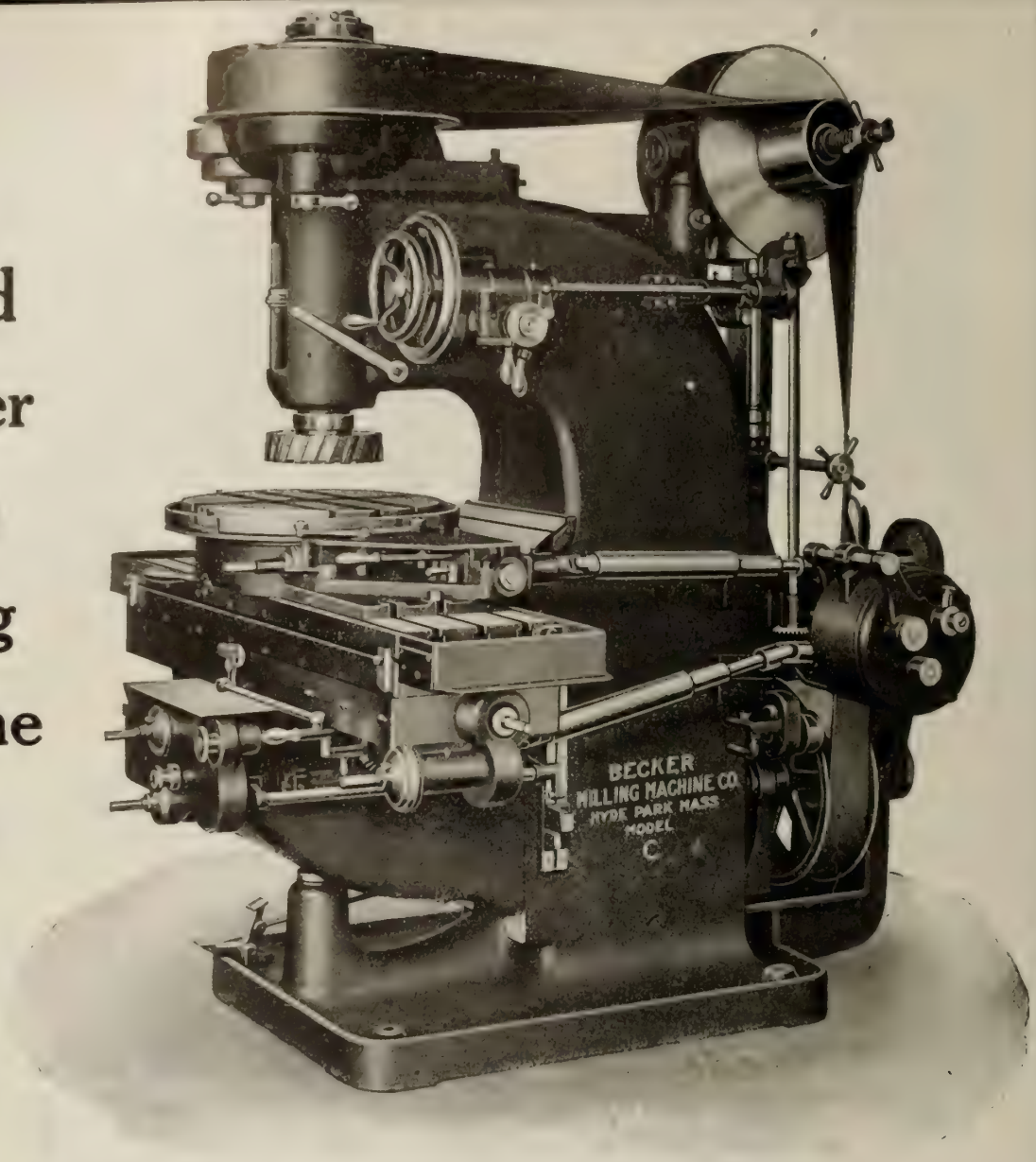
AS YOU LIKE IT

A Bench Lathe, or a Screw Machine, with Automatic Chuck Closer, Double Tool Cross Slide and Turret. Drill, Tap and Die Holders carried in stock.

Hardinge Bros. Inc.

3133-3141 Lincoln Avenue
Chicago - Illinois

The Record Breaker in the Milling Machine Field



The Open Belt Drive on the New Model "C" Becker Mill ng Machine is one of the features that has helped to make these records of rapid, accurate milling.

The belt drive doesn't absorb power like the all-gear driven machines. It not only saves power and insures smooth action, but it prevents the constant vibration so noticeable in all-gear driven millers, due to the back-lash of the gears.

Practically all the work you have to do can be done on the New Model Becker by the use of the belt drive. And for extra heavy cuts, back gears are provided, which can be thrown in if needed.

Large direct spindle drives and wide double belts of high velocity, combined with powerful variable feed mechanism, and every convenience for operating, are enabling the Becker to break profitable production records in the milling field.

THE WHOLE STORY IS IN OUR CATALOG 56 C.M.—GET IT

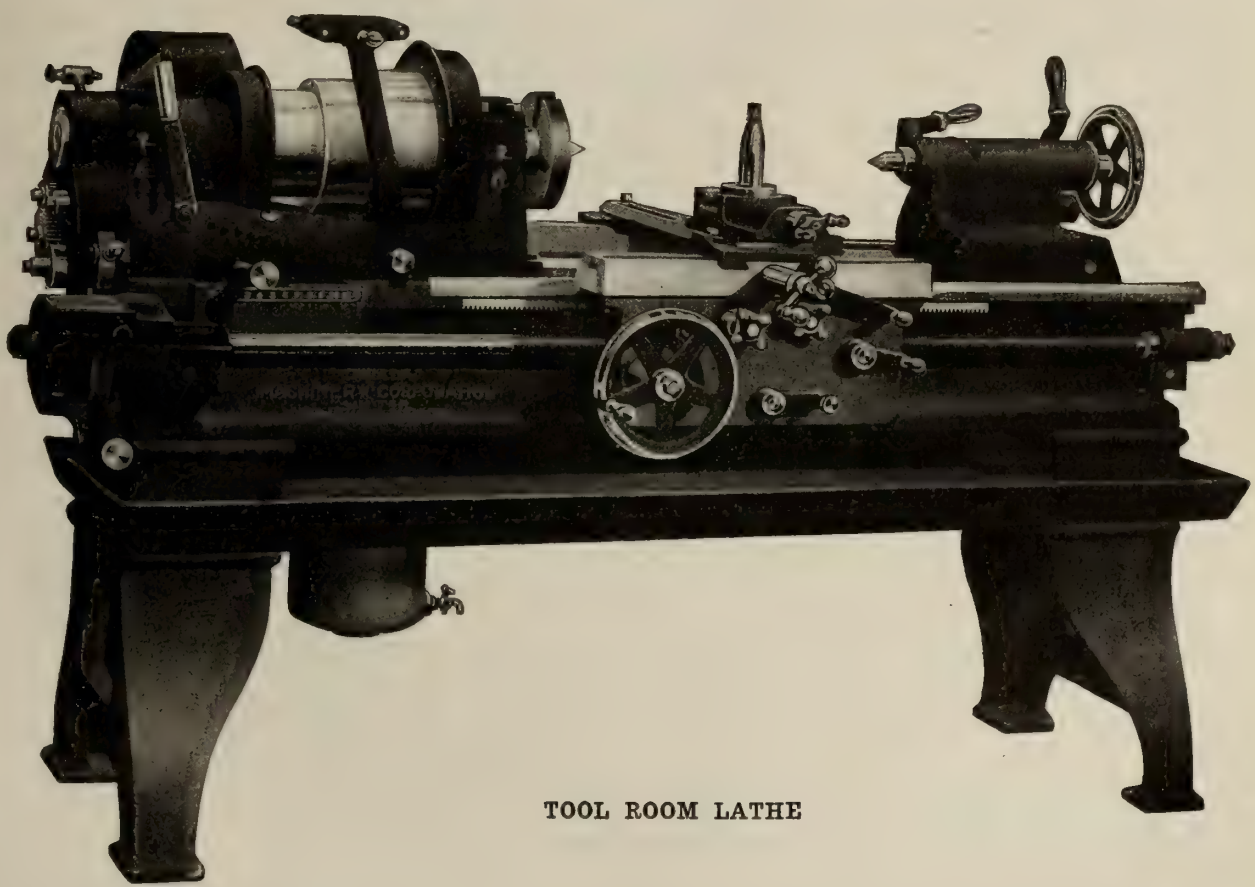
THE BECKER MILLING MACHINE COMPANY, HYDE PARK, MASS., U.S.A.

Agents—Niles Bement Pond Co., New York Selson Engineering Co., Ltd., London, England Schuchardt & Schutte, Berlin, Germany; Vienna, Austria; Stockholm, Sweden, St. Petersburg, Russia, Copenhagen, Denmark, Budapest, Hungary; Shanghai, China; Tokio, Japan.

CANADA MACHINERY CORPORATION, LIMITED

Lathes, Shapers, Planers, Slotters, Punches, Shears

Latest Designs, Finest Workmanship



TOOL ROOM LATHE

Note the appearance of this machine. Hundreds of them in use, and every one giving satisfaction. One grade only and that the best.

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Canada Machinery Corporation, Limited

GALT, ONTARIO

Don't fail to mention "Canadian Machinery" in writing to advertisers.

DESIRABLE LOT OF

SECOND-HAND MACHINE TOOLS

Modern Machines. All in A-1 Condition. Many as Good as New.

This is the only time this list will appear—keep for future use.

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1 No. 2-A. 56" Table, 34" Automatic Feed Universal Miller.
1 No. 1 Hendey Universal Miller and Equipment, not Back-Geared.
1 No. 1 B. & S. Universal Miller, not Back-Geared and Vert. Spindle Att.
2 No. 12 Garvin Millers and No. 13 Plain Vises.
3 No. 13 Garvin Plain Millers and Swivel Vises.
1 No. 13 Garvin Plain Miller with No. 2 Plain Dividing Head.
1 No. 14-A Plain Milling Machine with 56" Table.
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1 Brainard Hand Miller.
4 Cook Lincoln Millers.
1 No. 1 Automatic Slot Milling and Keyseating Machine.
3 Worm Screw Milling Machines.
1 No. 1 American Valve Milling Machine.
1 Burke Bench Miller and Vise.
3 No. 11 Brown & S. Miller, 12" Automatic Feed.
1 No. 21 Garvin Plain Miller.
1 No. 0-2 Spindle Garvin W. D. Profiler.
2 No. 4 Back-Geared Garvin Profiler.

LATHES.

1 10"x7' Champion Screw Cutting Eng. Lathe.
1 12"x5' C. R. Engine La., no Screw Cutting. N. Y. Steam Eng. Co.
1 12"x6' C. R. Reed Lathe with 6" 4-J. Ind. Chuck.
1 12-13"x6' C. R. Reed Lathe, with 4" 3-J Chuck.
1 14-16"x6' C. R. Reed Chuck.
1 14-15"x6' C. R. Putnam Lathe, Taper Att., 3½" 3-J Chuck.
1 14"x6' R. F. Reed La. 9" 3-J Chuck.
2 14"x6' R. F. Reed Lathes.
1 14"x6' Hamilton "A" Quick Change Gear Pattern Screw Cutting Engine Lathe, with taper attachment.
1 14"x6' Hamilton "B" Engine Lathe.
1 14"x6' R|F Blaisdell Engine Lathe.
1 16-17"x6' C. R. Putnam Lathe, Taper Att. and Grinding Att.
1 16"x6' C. R. Reed Lathe and 10 Chuck.
1 16"x6' Nutter & Barnes R. F. Lathe.
1 16"x6' Perkins Plain Rest Lathe.
1 17"x6' Blaisdell Plain Rest Lathe, Power Cross Feed.
1 18"x6' C. R. Reed Lathe and 10" Chuck.
1 18"x8' Ralm Carpenter C.R Lathe.
1 19"x7' Pratt & Whitney Back-Geared Turning Lathe, not screw cutting.
1 18"x8' Fitchburg Lathe, Taper Att. Comp. Rest.
1 16" Speed Lathe, Lever Tailstock.
8 12"x4' Hill Speed Lathes, with Slide Rests.
1 16"x4' Reed Speed Lathe.
7 Pratt & Whitney Bench Lathes, and Countershafts and Slide Rests.
9 Cataract Bench Lathes and Slide Rests.
1 Rivet Bench Lathe. Complete Attachments.

SCREW MACHINES.

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1 Warner & Swasey No. 4 Plain Head Wire Feed Screw Machine, 1 7-16-in. capacity.
1 Warner & Swasey Wire-Feed Screw Machine, 20 Collets.
1 Warner & Swasey No. 5 Screw Machine, Friction Head.
3 No. 2½ Plain Garvin Screw Machines.
1 15" Ballard Turret Machine, with 9" 2-J Slip Jaw Chuck.
1 Meriden Undercut Forming Lathe.
1 No. 1 Pratt & Whitney Plain Screw Machine.
1 No. 1 Pratt & Whitney Wire Feed Screw Machine.
1 No. 1 Hartford Automatic Stud Machine.
1 No. 0 B. & S. Wire-Feed Screw Machine, with lot of tools.
1 No. 12 Automatic Screw Machine, Pratt & Whitney, with magazine feed.
1 Cleveland 2" Automatic Screw Machine.
1 14"x6' Turret Lathe.
1 No. 5 Windsor Screw Machine.
1 No. 31 Garvin Monitor Lathe and Rear Former.
1 No. 3 Garvin Double Turret Screw Machine.
1 No. 22 Garvin Monitor Lathe, Treadle and Box Chuck.
2 No. 3 Garvin Fricton Head Power Feed Screw Machines.
1 No. 2 Pratt & Whitney Plain Screw Machine.
2 Pratt & Whitney Automatic Turret Lathe
1 ¼" Pratt & Whitney Automatic Stud Machine.
1 1¼" Pratt & Whitney Wire Feed Screw Machine.
1 Burton Chuck and Facing Machine.
3 Garvin Automatic Stud Machines.
1 2x12 Garvin Screw Machine, Complete.

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1 Hamilton 2½' Plain Radial Drill, with worm swiveling and rd. tables.
1 Dresses 32" Simplex Radial Drill, round table.
3 Two-Spindle Sigourney Drills and 5-16" Chucks.
1 13" Two-Spindle Slate Drill and 5-16" Chuck.
1 Prentice 20" Upright Drill and 1" Chuck.
1 Four-Spindle 13" Reed Drill and four chucks.
1 Three-Spindle Sigourney Drill and 5-16" Chuck.
1 No. 4 Four-Spindle Garvin Drill-Press.
1 10" Six-Spindle Stover Revolving Head Drill.
1 2½' Bickford Radial Drill.
1 24" Back-Geared Sldg. Head Blaisdell Drill.
1 2-Spindle R. & K. Bicycle Rim Drill.
1 Gen. Elec. Co., Elec. Flexible Tube Drill.

PLANERS.

18½"x18½"x15" Whitcomb Crank Planer.
1 18"x18"x4' Pond Planer.
1 27"x27"x6 Ohio Planer.
1 32"x32"x11' Pratt & Whitney Planer.
1 36"x36"x8' Whitcomb Planer.
1 12" Whitcomb Crank Planer.

POWER HACK SAWS.

1 No. 2 Robertson Power Hack Saw.
1 6" Goodell Power Hack Saw.
1 6" Olmstead Power Hack Saw.

BORING MILLS.

1 Newark Boring Mill, 2⅜" Spindle, table 18"x30": boring att. and bars.
1 No. 2 Beaman & Smith Horizontal Boring Machine.

POWER PRESSES.

1 No. 23 V. & O. Power Press and four Bolsters.
3 No. 19 Bliss Power Presses.
1 No. 19 Stiles & Fladd Power Press.
1 No. 018 Bliss Power Press, Bench.
2 No. 3 Greenerd Arbor Press.
1 Bench Straightening Press, 20" Table.
1 No. 3½ Greenerd Arbor Press.
3 Bench Presses.
1 Bench Straightening Press.

SHAPERS.

1 15" Springfield Shaper.
1 16" Hamilton Back-Geared Shaper, (no table support).

GRINDING AND POLISHING MACHINERY.

1 Garvin No. 3 Universal Cutter and Surface Grinder.
1 Garvin-Dutton Dry Grinder.
1 No. 10 Besley Grinder and Disc Press.
1 T. & L. Pulley Polishing Machines.
1 Cleveland Bench Polishing Machine, T. & L. Pulley.
1 Zucker-Levitt Bench Polishing Machine, T. & L. Pulley.
1 Two-Wheel Springfield Water Tool Grinder.
1 Sellers Twist Drill Grinder.
1 Pratt & Whitney Drill Grinder.
1 Sellers Tool Grinder.
1 Grinder Head.
1 No. 1 Garvin Bench Cutter Grinder.
6 No. 2 Diamond Polishing Heads.

TAPPING MACHINES.

3 No. 2 Automatic Tapping Machine, with chuck.
2 No. 2 Garvin Horizontal Tapping Machines.
1 No. Tuttle Tapping Machine.
1 No. 1 Automatic Tapper.
1 No. 0 Vertical Tapper, Mounted.
1 No. 1 Horizontal Tapper.

MISCELLANEOUS.

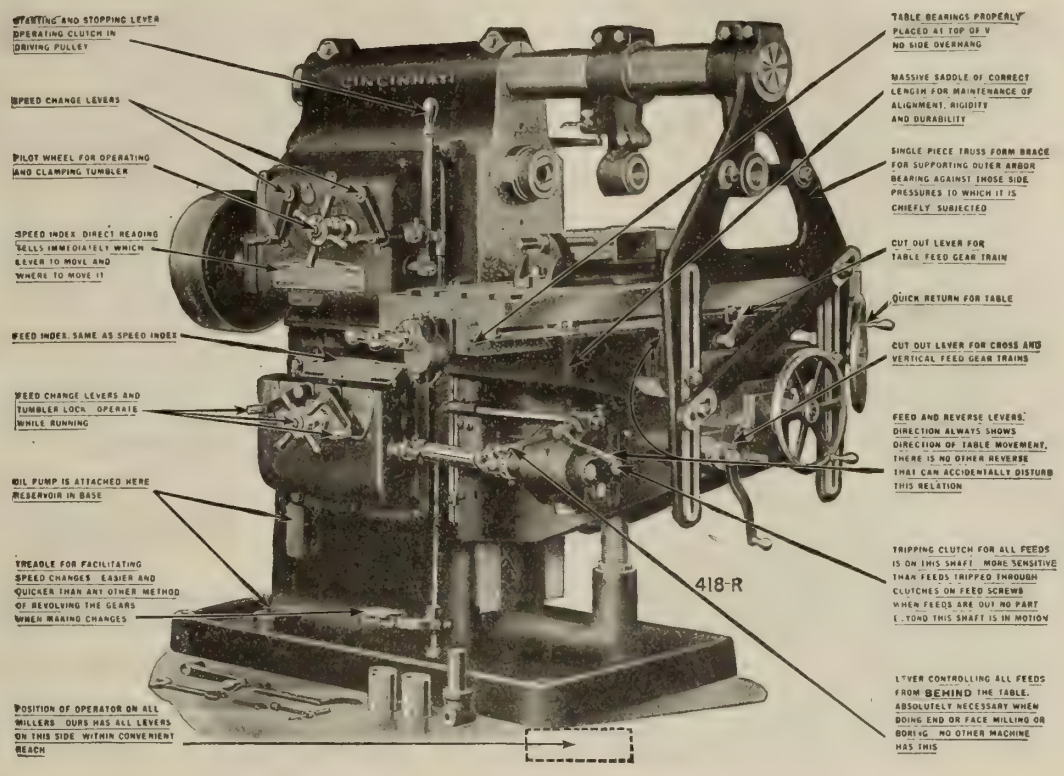
1 36" Becker, Brainard Automatic Spur & Bevel Gear Cutting Machine.
1 No. 2 Plain Garvin Dividing Head and Tailstock.
1 No. ½ Mossberg & Granville Drop Hammer.
1 30" Geo. A. Ohl. F. A. Power Shear.
1 No. 3 Young Shear.
1 No. 2 Combination Punch and Shear.
1 Rotary Bench Shear.
1 Grabo Saw Table.
1 Diamond Belt Strapping Machine.
1 C. & C. 6 H.P. Motor, 230 Volt.
1 7 H.P. Motor and Starting Box.
1 Bernard 15 H.P. Motor, 250 Volt.
1 20" Gilkenson Measuring Machine.
1 Forge.
1 Anvil.
1 Simplex Filing Machine and Saw.
1 Hartford Bench Filing Machine.
1 Plunger Punch.
2 Garvin Vertical Milling Attachments for No. 3 Hand Miller.
1 No. 2 Spiral Milling Attachment.
1 Pair No. 2 Garvin Index Centers.
2 Pair No. 3 Garvin Index Centers.
1 Pair No. 4 Garvin Index Centers.
1 Pair No. 5 Garvin Index Centers.
2 Slotting Attachments.
2 Rotary Table 18".
1 No. 2-V Vertical and Horizontal Spindle Milling Attachment.
1 Mossberg Standard Screw Press.
1 14x30 Tumbling Barrel.
1 Eureka Jig Saw.
1 30" Paxson Band Saw.
1 24"x30" Fairbanks Scale.
1 No. 3 American Gas Forge & Muffler.
1 No. 2 American Gas Furnace Co.'s High Pressure Blower.
1 Melting Pot.
1 30" Tinners Folder.
1 2" Saunders Pipe Machine and Dies.
1 No. 2-A Saunders Pipe Machine, 2" Capacity.
1 Wiley-Russell Bolt Cutter, 2" capacity.
1 2" Sellers Bolt Cutter.
1 Bolt Cutter and Dies.
1 10 H.P. Westinghouse Engine.
1 Molding Machine.
1 No. 00 Waterbury Nipple Heading Machine.
215 lbs. Second Hand Belting.
1 Air Compressor.
1 Tank Steam Pump and Holder.
1 6" Lawrence Pump.
1 New Century Platform Scale.
1 Pipe Vise.
1 Lobfe Pump.
1 12" Garvin Slide Rest.
1 Hand Lathe Slide Rest.
1 Garvin Needle Machine.

FOR SALE BY

THE GARVIN MACHINE CO.

SPRING AND VARICK STREETS. Visitors Welcome. 45 years in NEW YORK CITY.

The advertiser would like to know where you saw his advertisement—tell him.



The combination of the operator and his machine forms a production unit. The efficiency of that unit depends largely upon the handiness of the machine. On most jobs the operating time is longer than the cutting time. The handiness of Cincinnati Millers reduces the operating time. This feature is as important as heavy cutting capacity. That is why we have given it special attention in all our designs and have developed handiness farther than any of our competitors. : : : :

The Cincinnati Milling Machine Co.

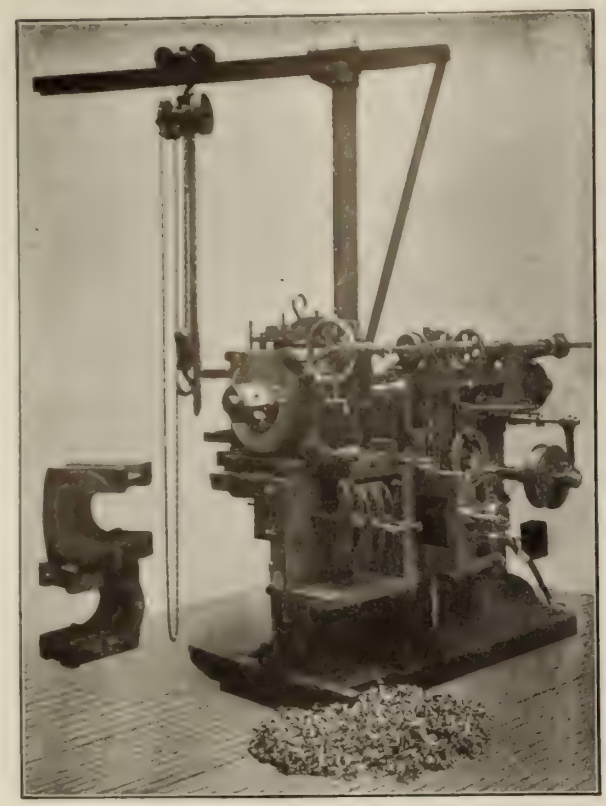
Cincinnati, - - Ohio, U.S.A

Canada Agent:

H. W. Petrie, Limited, Toronto, Montreal and Vancouver

Don't fail to mention "Canadian Machinery" in writing to advertisers.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

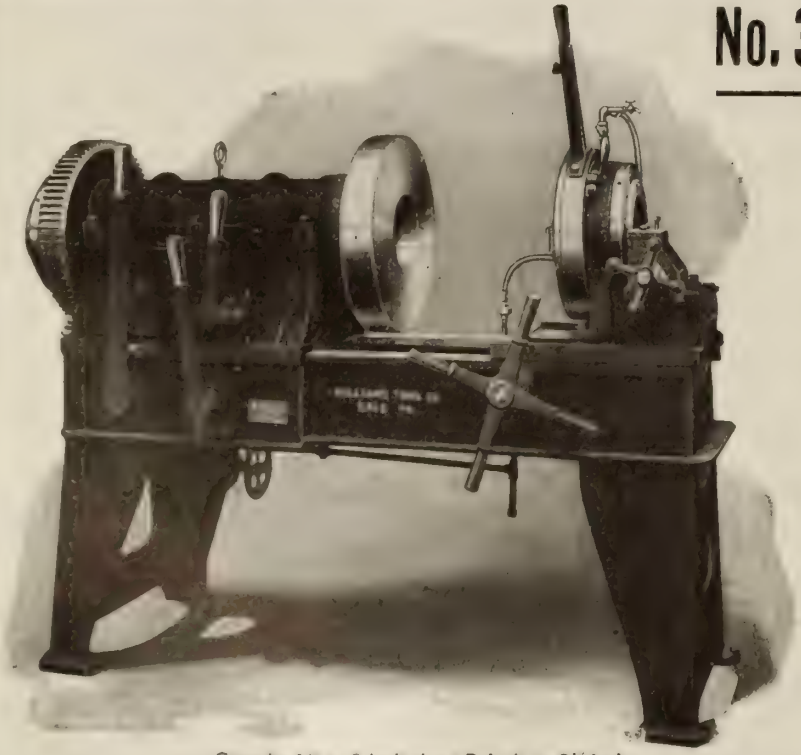
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1½ to 6 inch pipe; Bolts ½ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2"; ½" to 3"; 1" to 4"; 1½" to 6"; 2" to 8" and 3½" to 12".

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

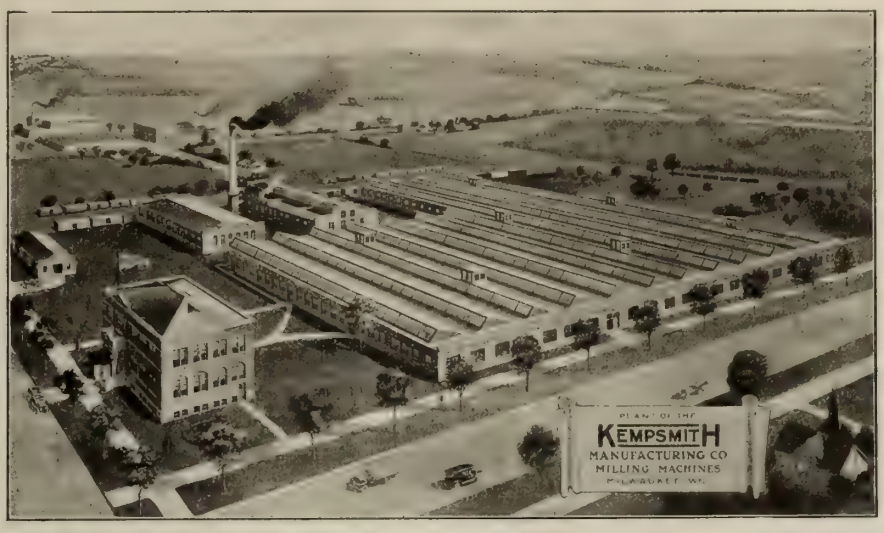
Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 **Erie, Pa., U. S. A.**

The advertiser would like to know where you saw his advertisement—tell him.

The Handsome, complete new factory devoted to the



Manufacture of KEMPSMITH MILLING MACHINES

Every detail of system and equipment carefully planned for its function in the production of these machines, and the plant as a whole is truly a model for its purpose. It will mean better product even than before.

THE IDEAL PLANT FOR SPECIALIZED MACHINE MANUFACTURE

The KEMPSMITH MFG. COMPANY, Milwaukee, Wis.

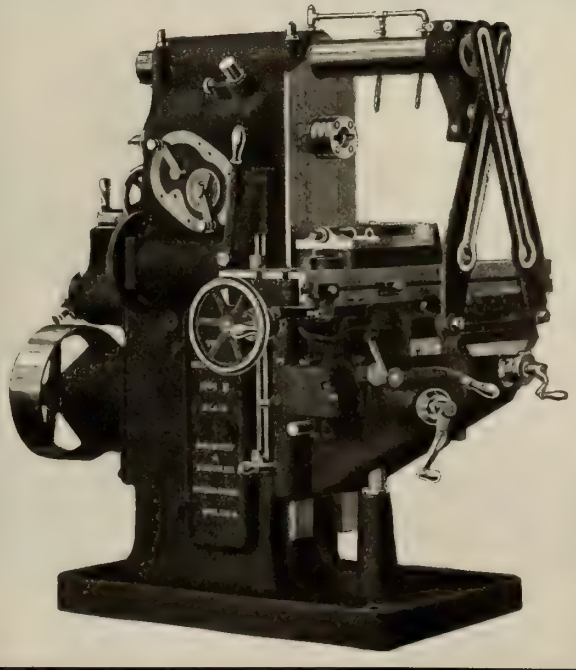
Canadian Agents: Rudel-Yeates Machinery Co., Montreal

KEARNEY & TRECKER CO.

Manufacturers of

Milwaukee Milling Machines

MILWAUKEE, Wis., U. S. A.



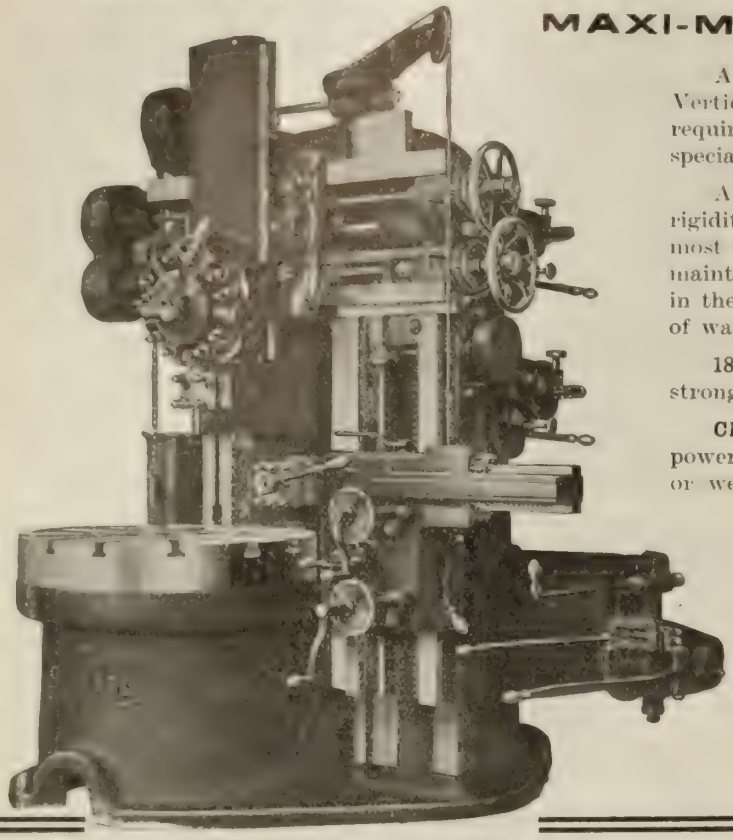
OUR DESIGN MAY NOT BE THE BEST

but we think it is and have attempted a justification of our belief in 1911 catalog now ready.

Canadian Agents:
A. R. WILLIAMS MACHINERY CO., Toronto, St. John, Winnipeg, Vancouver;
WILLIAMS & WILSON, Limited, Montreal.

The 42-Inch Vertical Turret Lathe

MAXI-MILL TYPE



A development of the maximum possibilities of the Vertical Turret Lathe based upon a knowledge of the requirements gained by extensive observation and a specialized experience as makers and users thereof.

A machine tool of extreme power, having weight, rigidity and materials of construction to withstand the most severe usage continuously with a minimum of maintenance cost, and operative features of proven value in the reduction of production costs by the "elimination of wasted time."

18,500 POUNDS OF SELECTED MATERIAL—it is strong and rigid.

CHROME NICKEL STEEL GEARING insures high power transmission continuously without breakage or wear.

CONTINUOUS FLOW LUBRICATION eliminates power loss and increases machine life.

CENTRALIZED CONTROL permits the operator to concentrate on production.

Circular CV-42 goes into full details and will be mailed on request.

The Bullard Machine Tool Co.
BRIDGEPORT, CONN., U.S.A.

POWER PUNCHING AND SHEARING MACHINERY

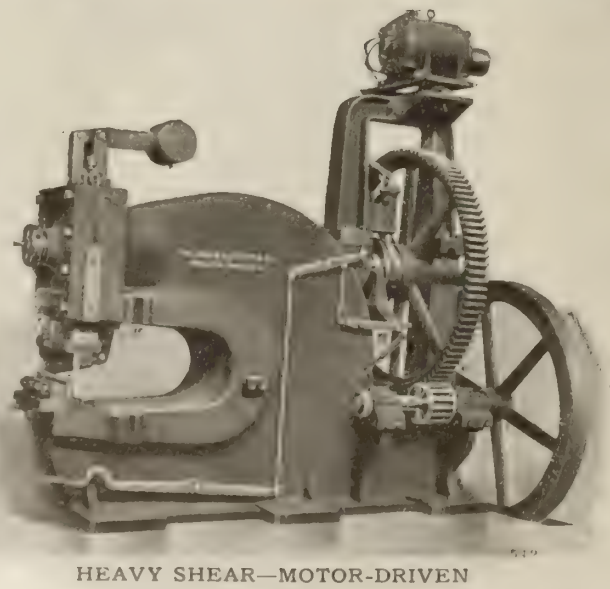
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

Tire Bending Rolls.

Bending and Forming Machines.

Drop and Helve Hammers, Etc., Etc.

Designed and Manufactured by

THE LONG & ALLSTATTER CO.
Hamilton, Ohio, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

LOOK UP CAREFULLY the new Operative Features of the

MODERN UNIVERSAL GRINDER



5" x 26" MACHINE

BEFORE YOU PLACE YOUR ORDER ELSEWHERE

Look over the compact lineup of this Grinder, the simplicity and accessibility of the operative parts, and think how carefully the whole design has been worked out even to the smallest details. We can show you some interesting improvements, designed to meet modern grinder requirements. Besides this our demonstrator is at your service to assist you in getting production and accuracy.

Users of our Grinders are getting results.

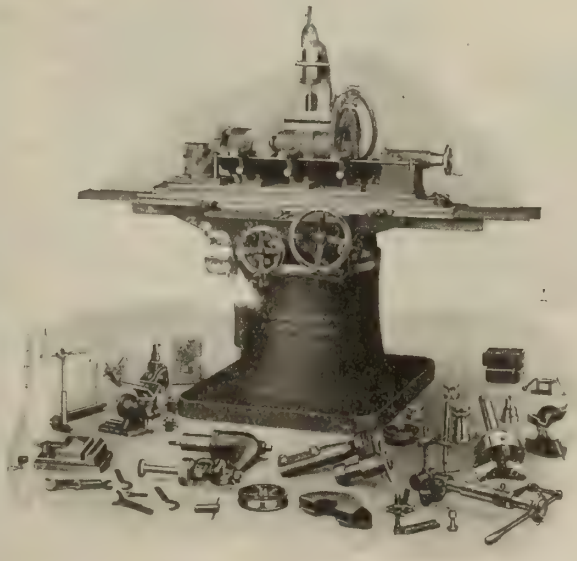
Let us show you how you can get production with accuracy.

Write for Catalogue

MODERN TOOL COMPANY

3rd and State Streets **Erie, Penna., U.S.A.**

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

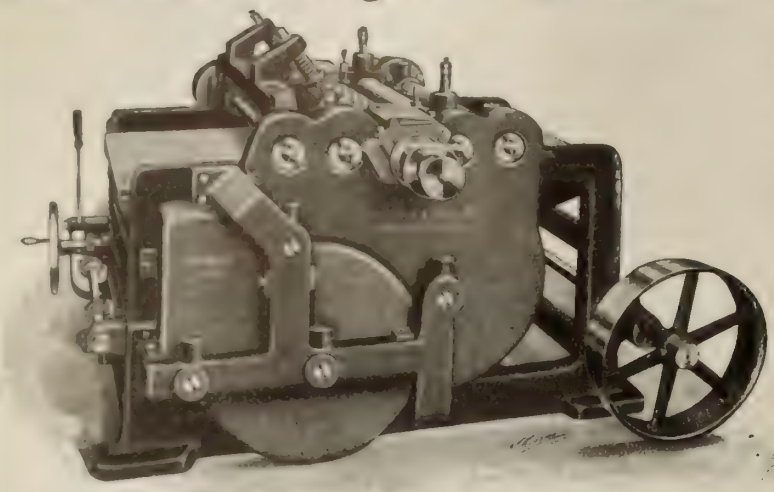
SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

SAMPLES

of work done on our

No. 156 Single Cylinder Smoothing Planer



Patented–No. 156 Cabinet Smoothing Planer

equipped with ROUND CUTTER-HEADS, AIR-HARDENED STEEL KNIVES, AUTOMATIC GRINDING AND TRUING ATTACHMENT, will convince you quicker than all the words we could use that we have the best single-cylinder smoothing planer it is possible to buy.

These samples gladly sent free upon request.

For producing extra smooth surfaces to take a fine finish, as used in Furniture, Piano and Cabinet Factories, this machine is in a class by itself.

You will be as enthusiastic about this machine as we are when you see the kind of work it turns out on fast feeds–impossible to find a knife mark–looks like it was sanded. A postcard to us will bring some of these samples and full description of this tool by return mail.

IT WILL PAY YOU TO SEND THIS CARD NOW.

J. A. FAY & EGAN CO., 362-382 W. Front St., CINCINNATI, O.

Sales Offices: Atlanta, New Orleans, St. Louis, Chicago, New York City, Buffalo, Baltimore, Seattle, Los Angeles, San Francisco, Evansville.

A High-Grade Small Engine Lathe at Moderate Cost!

With or Without Quick Change Gear Device.—Three or Five Step Cone. You can use one in YOUR shop.



FREE from fussy attachments and mere talking points, the Von Wyck 15-inch engine lathe offers such a combination of convenience and economy that operators maintain, "It is unequalled by any lathe of its swing."

WHY buy a large size and pay a big price to get great strength and efficiency? Von Wyck design and construction are thoroughly high grade in every important detail and satisfactorily cover an unusual range of work.

VON WYCK

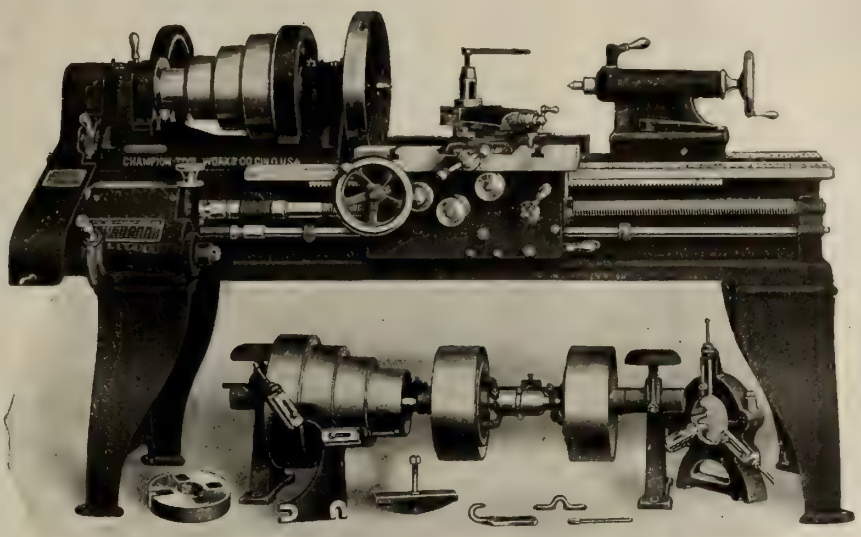
MACHINE TOOL COMPANY

Cincinnati, O., U.S.A.

Rudel-Yeates Machinery Co., Montreal

Canadian Agents

You will get better results by using



16-in. Quick Change Lathe.

CHAMPION LATHES

on account of their increased capacity for heavy, accurate work and their improved conveniences.

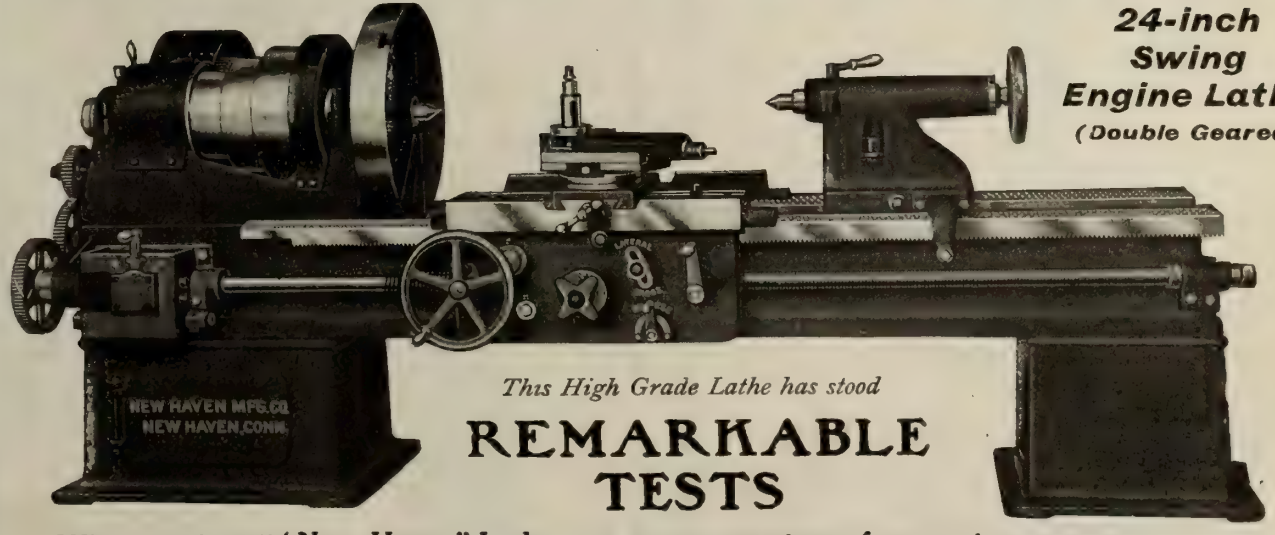
Our 16-inch Lathe has a 1⅝ inch hole through the spindle, swings 17⅛ in. over the bed and 11⅝ in. over carriage. Has 40 rapid feed and thread changes, Automatic Stop in either direction, Power Friction Cross and Length Feeds, removable Rack Pinion, cuts Screws from 2 to 56 per inch, including 11½, Taper Gibbed, all graduations, and every Gear Safely Guarded.

Catalogue of 10-12-14-16 and 18-inch sizes gives other details.

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.

Absolute Reliability in NEW HAVEN LATHES



24-inch Swing Engine Lathe
(Double Geared)

This High Grade Lathe has stood

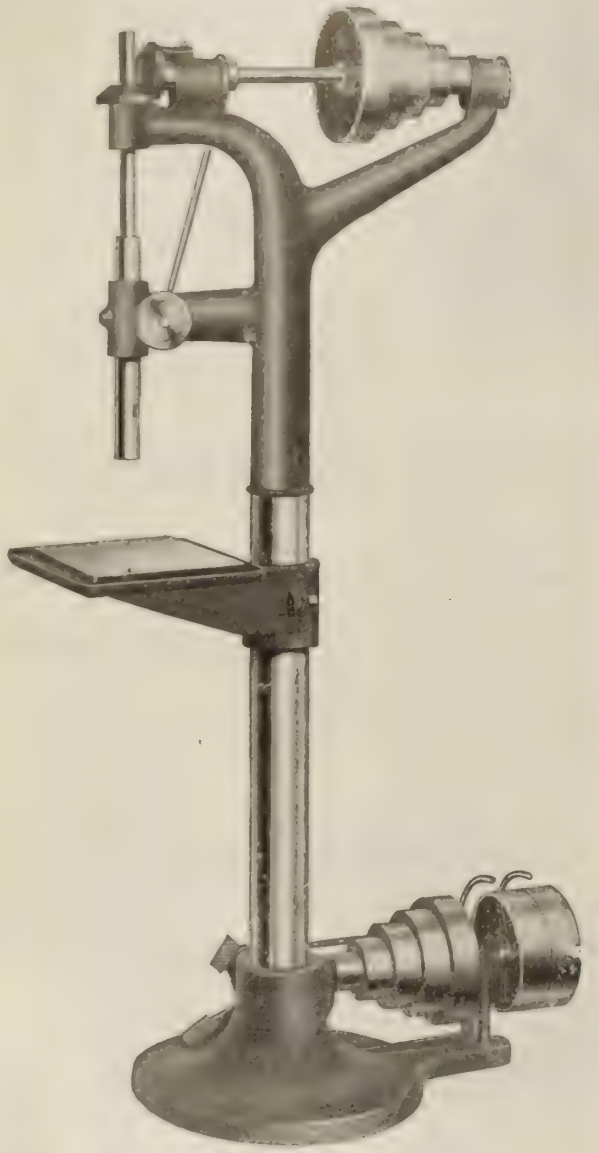
REMARKABLE TESTS

When you install **"New Haven" Lathes** you get **many returns for your investment.**
They are adapted for all kinds of work and perform their functions with the greatest possible ease.
New Haven Lathe accuracy has made it valuable to every shop. It is frictionless and powerful---will save money, time and trouble wherever it is used.
Every New Haven Lathe has an unrestricted guarantee of continuous, satisfactory service.

Write for catalog of New Haven Tools.

New Haven Manufacturing Co. NEW HAVEN, CONN., U.S.A.

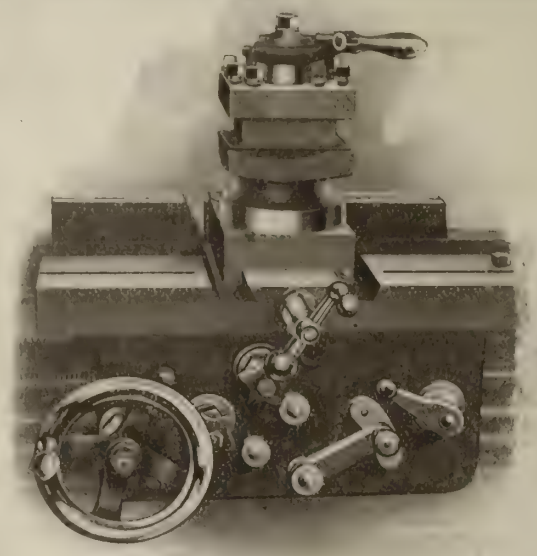
Another New Sibley Drilling Machine



Self-oiling throughout.
Sixteen-inch Swing.

Sibley Machine Tool Company

Church Lane
South Bend, Ind., U.S.A.



We want to furnish you with one of these

Four Sided Tool Posts

to go on your lathe. We fit them to any make of lathe so they operate by the regular cross feed screw. Don't stick to the old-fashioned single tool post, but insist on having your lathe equipped with a **Fay & Scott Patented Type.**

Send for Booklet.

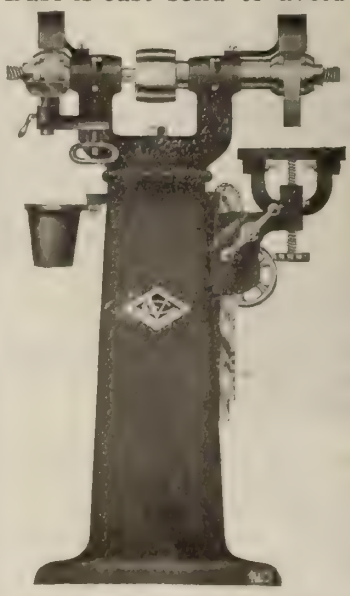
FAY & SCOTT : Dexter, Maine

Canadian Agents—Williams & Wilson, Montreal, Que.; A. R. Williams Machinery Co., Toronto: A. R. Williams Machinery Co., Winnipeg: General Supply Co. of Ottawa, Canada.

Valley City No. 3

This Tool and Surface Grinder has an unequalled production range where quantities of key-fitting, punch, die and tool sharpening are concerned.

Base is cast solid to avoid vibration and permit high speed. Convenient and rigid knee and table operated by hand wheel, holds work solidly in any desired position.



Table, 11 x 20 inches, has a vertical travel of 12 ins. on the guides and may also be equipped with a reversible sliding table.

Floor space required, 28 x 20 inches. A very convenient all-around machine for general shop or tool room grinding.

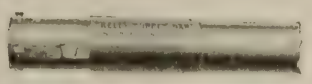
Send for catalog of grinding and polishing machinery.

Valley City Machine Works
GRAND RAPIDS, MICH.

KELLY Adjustable High Speed Boring Tools and Floating REAMERS

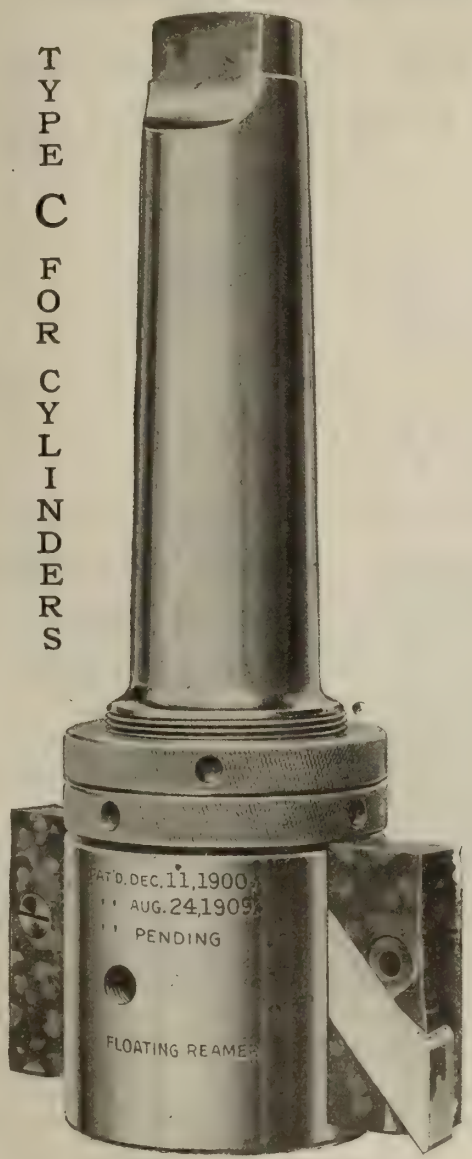
TYPE B

Reduced size cut of turret bar, showing boring tool ahead of floating reamer, for light chip, to true up hole in Tough Bronze, "Auto Steel," Tubing, Etc



Kelly records 1200 hours, size and finish.

TYPE C FOR CYLINDERS



REPLACEABLE HIGH SPEED BLADES

Type C for Cylinders 3" to 12" diam.
Type B for Turret Work 1" to 5" diam.
Carried in stock.

"JONES PAYS THE FREIGHT"

Dear Mr. Jones:-

If you will insist on having your engine cylinders reamed with a Kelly Reamer you will find that you will still have "Compression" long after "Mr. Smith's" EMERY-GROUND Cylinders are worn out; in fact, after his engine has run a month, you can "cut circles around him" out in the country.

THE REASON:-The old method-still used by some builders-was, to bore cylinders nearly to size and then GRIND them to size and finish, leaving the pores of the iron filled with EMERY GRIT-making "Emery-Laps" of both piston and cylinder from the start. The KELLY way is to bore the cylinder true to within .005", then REAM with the "floating" reamer, giving size correct to a TEN THOUSANDTH of an inch and an absolutely perfect surface, entirely free from emery grit.

The deduction is obvious, we leave it to you, get the right kind and your "freight bills" will be light.

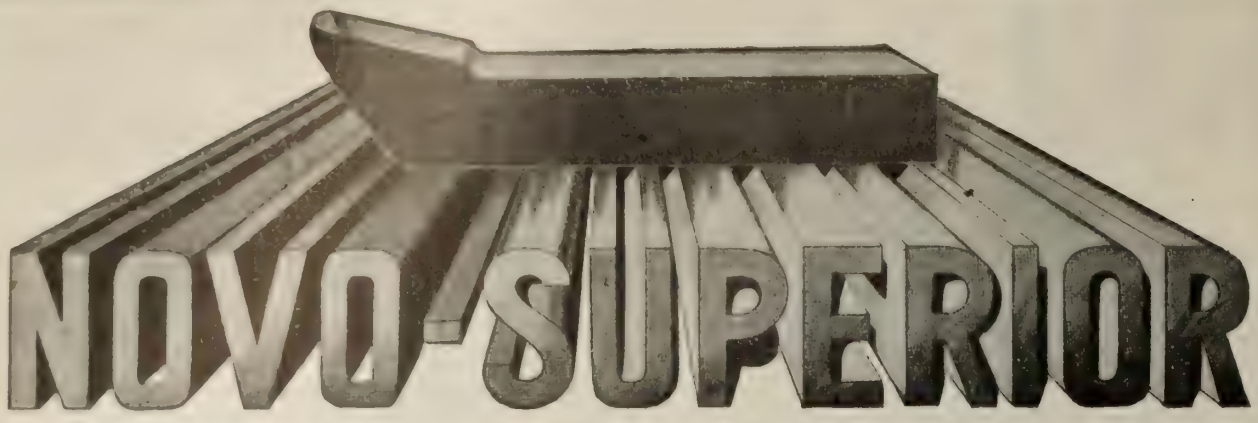
Hoping this may be of service to you,
I am
Very truly yours,
W. E. KELLY, President.

The Kelly Reamer Co.

1555-7 Columbus Road (old S. Water St.)

Cleveland, Ohio.

Charles Neat & Co., Agents, 112 Queen Victoria St., London, Eng.



High Speed Steel Has a Solid Foundation In a Name That Means Something

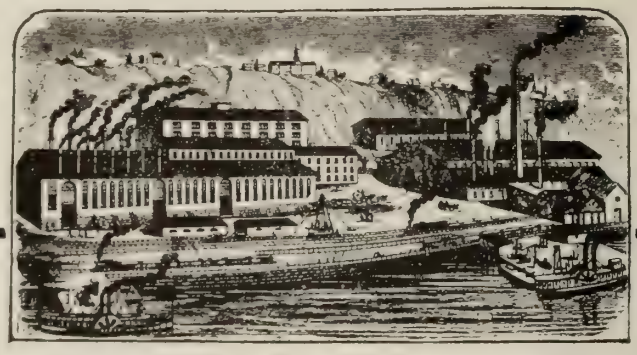
Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND MONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL

MARINE ENGINES and PUMPS. SHOE MACHINERY A Specialty



BRASS and IRON CASTINGS. BOILERS and REPAIRS.

That we have exceptional facilities at our disposal for the manufacture of all kinds of Machinery—in addition to our business as Brass and Iron Founders, General Contractors and Shoe Machinery Engineers—has been amply proved this year. In the short space of five months, we built and installed all the Engines and Boilers of the new sister steamers "Levis" and "Lauzon," whose trial trips were a complete success. We make a specialty of all kinds of Marine Engine Work, and shall be glad to quote for first-rate products only.

SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

Wire of every description for Slugger and Standard Screw Machines.

The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director

LEVIS, Quebec

The advertiser would like to know where you saw his advertisement—tell him.

FIRTH'S TOOL STEELS ARE THE BEST

SPEEDICUT B. C.
SPEEDICUT MAXIMUM } Our latest production in High Speed Steel

The toughest, keenest cutting, most durable steel manufactured for Lathe and Planer Tools, Milling Cutters, Taps, Reamers, Drills, Marking Dies, Woodworking Tools, Etc.

For all round efficiency for **general** purposes **Speedicut** holds first place.

FIRTH'S EXTRA TOOL STEEL
FIRTH'S BEST TOOL STEEL } Standard brand known everywhere. In all tempers. For all purposes

Crucible Sheet and Strip Steel, Pivot Steel, Cutlery Steel, Nickel Alloy Steels, Mining Drill Steel, Shoes and Dies, Locomotive Tyres, Heavy Forgings, Projectiles, Files and Rasps.

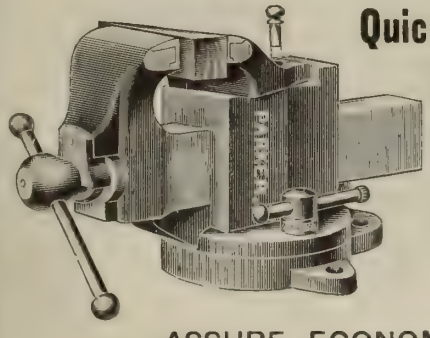
THOS. FIRTH & SONS, Limited

Norfolk Works: SHEFFIELD, England

Canadian Warehouse: 507 St. Paul Street, Montreal

J. A. SHERWOOD, Agent

PARKER'S



Quick Working, Efficient, Convenient, SWIVEL VICTOR VISES

ASSURE ECONOMY

By one motion of either right or left hand any piece of work can be instantly grasped in the Parker vise.

The leading feature of all our vises is the solid steel strenghening bar, also solid under portion of front jaw.

Parker's vises are made by expert men who make this line their specialty.

All parts are interchangeable.

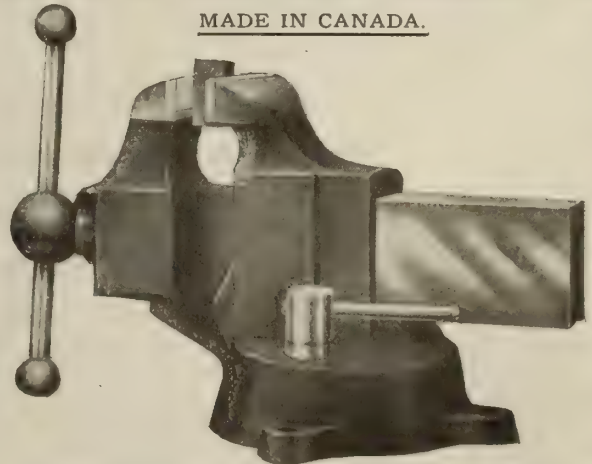
The Charles Parker Co.

Meriden, Conn., U.S.A.

The YOST

Solid Jaw and Swivel Bottom Machinist's Vise

MADE IN CANADA.



A vise with a grip like grim death; a durability that defies time and the hardest usage.

A vise that will give you a lifetime of perfect service and satisfaction. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

Incomparably Good

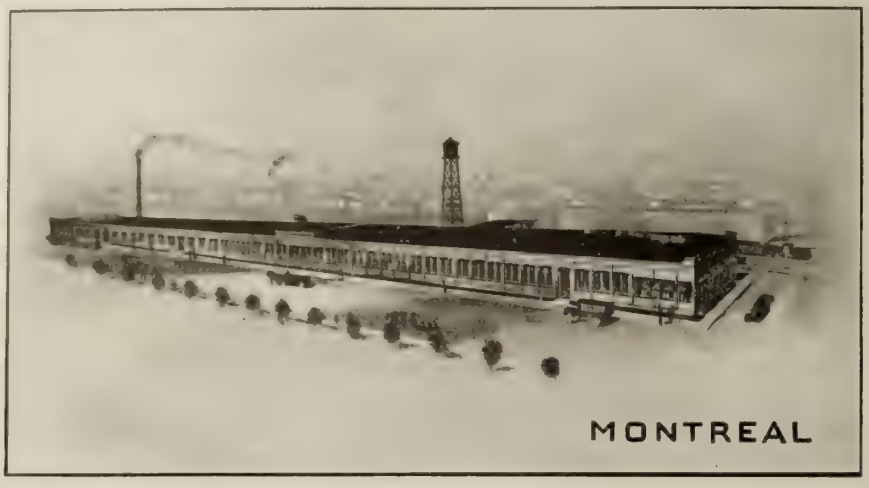
The National catalog would certainly interest you. Write us, asking for a copy.

National Machinery & Supply Co., Ltd.

HAMILTON - - ONTARIO

This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.

"UP TO THE MINUTE"



This is the way the new plant, equipment, methods and product of the new screw plant at Montreal are being characterized. A complete stock of standard goods is carried and specials are made up to customers' specifications and entire satisfaction.

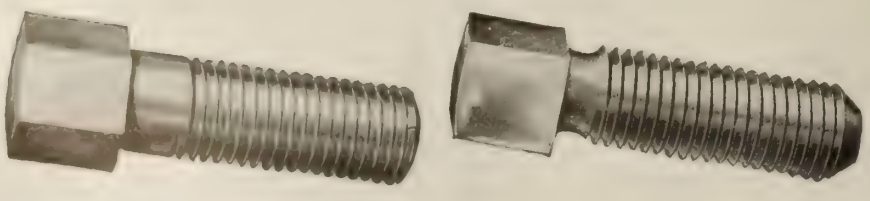
The Plant has been built to a plan developed by making millions of parts and at the expenditure of thousands of dollars to get at the most economical and efficient screw making practices. It is managed by experienced screw makers and run by Canadian mechanics; the equipment is new and of the most economical type throughout.

SEND THE SAMPLES OR ASK FOR NEW CATALOGUE OF "MILLED PRODUCTS" COVERING STOCK.

THE NATIONAL-ACME MANUFACTURING CO.

MONTREAL, St. Elizabeth St. and G.T.R.

NEW YORK, 77 White St.; CHICAGO, 549 Washington Blvd.; BOSTON, 141 Milk St.; DETROIT, 1222 Majestic Bldg.; ATLANTA, Candler Bldg.; Factories, CLEVELAND, MONTREAL; Warehouses, NEW YORK, CHICAGO.



The advertiser would like to know where you saw his advertisement—tell him.

NICHOLSON
MADE FILES

The Choice of the Mechanic Who Knows

Every first class mechanic throughout the United States and Canada demands a sharp, clean-cutting file, a file that is built for service and dependability.

Years of experience, combined with a special effort of skilled mechanics to produce a high grade file at a reasonable price, have put NICHOLSON-MADE Files far ahead of all others on the market.

NICHOLSON-MADE Files are manufactured from special steel made on formula suited to the uses intended.

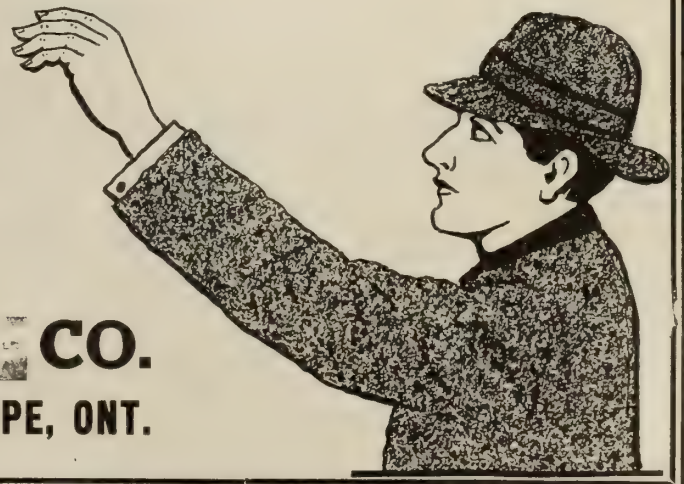
NICHOLSON-MADE Brands manufactured in Canada are:—

AMERICAN, ARCADE, GREAT WESTERN, GLOBE, EAGLE, MCLELLAN, KEARNEY & FOOT, J. B. SMITH.

NICHOLSON-MADE FILES are guaranteed to give perfect performance.



Write us or ask your dealer



NICHOLSON FILE CO.

DOMINION WORKS - PORT HOPE, ONT.

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

REPRESENTATIVES

L. F. McClernan
1243 Peoples Gas Bldg.
CHICAGO

L. F. McClernan
1417 Ford Bldg.
DETROIT

L. D. Rockwell
U.S. Express Bldg.
NEW YORK

Blau-Gas For Welding and Industrial Purposes

CANADIAN COTTONS, LTD., CORNWALL.

"In reply to your inquiry of the 8th inst., we beg to advise you that so far the repairs you have executed for us have been satisfactory."

THE ROYAL LINE S.S. ROYAL GEORGE.

"At your request for a recommendation with reference to Blaugas, I would say that we have used your Blaugas and Oxygen for cutting out rivets and plates, and have found it extremely satisfactory. It is much quicker than any other method of cutting I have seen used, also it can be used in places where hand-work is impossible. I have much pleasure in recommending it to anyone requiring expeditious work of this kind."

THOS DAVIDSON MFG. CO., MONTREAL.

"We have your favor of the 31st ult., and beg to say that we have tested the boiler you welded for us and found it perfect."

WESTMOUNT AUTOMOBILE REPAIR SHOP.

"We are very pleased to say that the repairs which you have executed for us are in every way satisfactory, and the Welding Outfit and Process are certainly to be highly recommended."

THE STOCKWELL MOTOR CO.

"In connection with the brazing you have done for us from time to time on automobile parts, we have pleasure in stating that in each and every case your work has been absolutely satisfactory to us in every respect."

ERNEST SCOTT, MONTREAL, MACHINIST AND TOOLMAKER.

"Replying to your inquiry of May 31st, would say that the repairs, welding, etc., that you have done for me the last few months have been very satisfactory, and I expect to send you my future work in this line."

CANADA CEMENT COMPANY, LTD., PLANT NO. 1.

"In reply to your inquiry I beg to advise you that we had the Blaugas installed at this plant about three months ago. Previous to that we were using Acetylene gas, which was most unsatisfactory for Laboratory purposes. I find this Blaugus excellent in every way; it gives a very hot flame, has no harmful effects on Platinum, and gives no trouble whatever. I can thoroughly recommend it for use in any Laboratory."

CANADIAN REFINING AND SMELTING CO.

"The Blaugas outfit which you installed in our Laboratory we are using for Bunsen burners and blast lamps for heating purposes, and it is entirely satisfactory."

WESTON SHOE CO., LTD.

"As far as we can tell, the outfit installed by you is doing satisfactory work, and everything is in good state."

WABASSO COTTON CO.

"This is to certify that at the present time we are regular users of BLAUGAS, and same is giving us entire satisfaction."

MONTREAL COTTON CO.

"We are pleased to state that our trials with your gas have proven very satisfactory. Its heating capacity, compared with gasolene, is much superior. Knowing its qualities, we enclose you a contract for the instalation of two plants for our works."

HOLLAND VARNISH CO.

"In reply to your enquiry of April 22nd, we would say that the Blaugas plant you installed for us is giving every satisfaction. We have no trouble whatever with it, and as we are outside of the district for city gas, we naturally find it indispensable."

ALLIS-CHALMERS-BULLOCK. **TUDHOPE MOTOR CO.** **DOMINION TEXTILE CO.**
HAMILTON POWDER CO. **O. B. SHOW COMPANY.** **MONTREAL WATER WORKS.**
and others are steady users of BLAUGAS.

The Blaugas Company of Canada, Limited

27 McGILL COLLEGE AVENUE : : MONTREAL

ONE HOUR'S WORK

WITH AN ELECTRIC WELDING MACHINE

THE BOY IS WELDING STEEL HOOPS FOR BARRELS



Sixty minutes' work and over a thousand in this pile (Count 'em.)

He places a hoop in the welder—the jaws come down and clamp the stock, the circuit is closed—the weld completed—the circuit breaker opens—the wire is released—all done automatically. Time: 3 seconds or 20 per minute.

It's a power driven machine requiring about half a horse power to run it. The speed can be varied from 15 to 30 welds per minute depending on size of stock. Can be used for a great variety of small work where it's the quantity that counts.

Figure the cost:	Current at 5c. per K.W. hour for 1,000 welds	.10
	Boy's time at 20c. per 1,000 welds -	.20
	Total for 1,000 welds - - -	.30

Ten thousand pieces per day at a cost of three dollars

This is only one of nearly fifty different kinds and styles of welders we make and if we haven't got what you need for your work—we'll make it. That's our specialty—building welding machines: good ones, of course, or we wouldn't be the largest manufacturers of welding machines in the country to-day.

By the way, our new bulletin is a text book on Spot Welding, or riveting without rivets, and it's yours for the asking.

No Lease. No License. No Royalty

The Toledo Electric Welder Company

CUMMINSVILLE, - - - CINCINNATI, OHIO

OXYGEN of guaranteed Purity by the Claude's Process. The largest and most up-to-date plant now in operation on this continent.

OXYACETYLENE and all systems of WELDING and CUTTING PLANTS.

For welding steel, cast iron, copper, brass, lead, aluminum. For cutting steel and wrought iron.

Sample and Repair Work Undertaken.

R. J. LEVY

Manufacturer of Oxygen

MAISONNEUVE, - - MONTREAL

Telephone East 6713

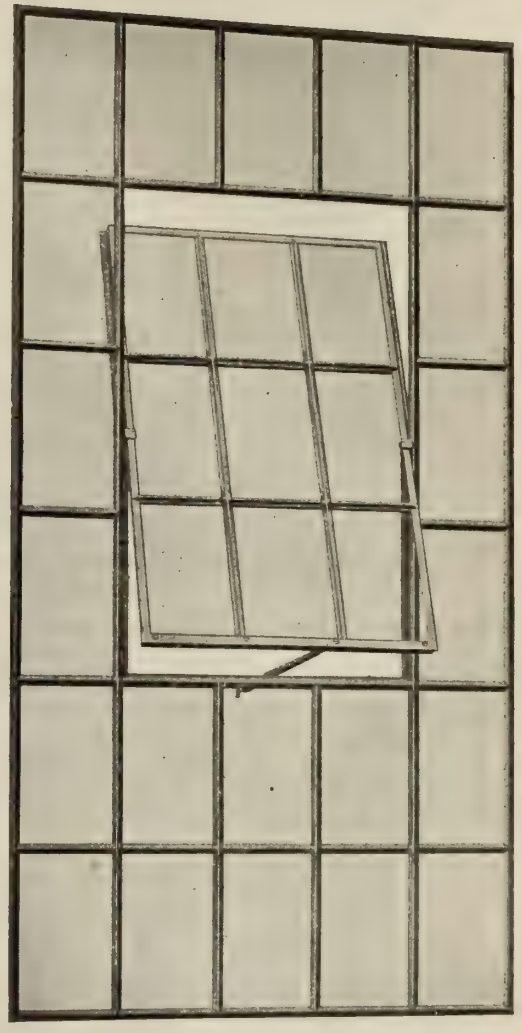


Portable Oxyacetylene Welding and Cutting Plant.

The advertiser would like to know where you saw his advertisement—tell him.

"Fenestra" TRADE MARK

What "Fenestra" Fireproof Sash Will do for YOU in YOUR Factory



¶ Protect from fire.

¶ Save insurance premiums.

¶ Prevent burglary by sneak-thieves or tramps.

¶ Admit from 25 to 40 per cent. more light than wood sash.

¶ Ventilate freely, supplying fresh air and removing foul air, smoke, gas, etc.

¶ Last indefinitely—Fenestra sash is impervious to rust, acid and smoke fumes.

¶ Greatly inprove the appearance of your factory and stamp its owner as a progressive man, choosing by common sense instead of cob-webbed precedent.

Our Catalog "F-2" is free to interested people. Ask us for a copy. Don't take your opinions on Steel Sash second-hand. Find out for yourself.

STEEL and RADIATION, Limited

TORONTO, Fraser Avenue 92 King St. W.

MONTREAL 138 Craig St. W.

OTTAWA - 85 Bank Street
QUEBEC - 153 St. Paul Street
ST. JOHN - 13 Germain Street

WINNIPEG - - 334 Garry Street
CALGARY - - 309 8th Avenue W
VANCOUVER - 416 Pacific Building

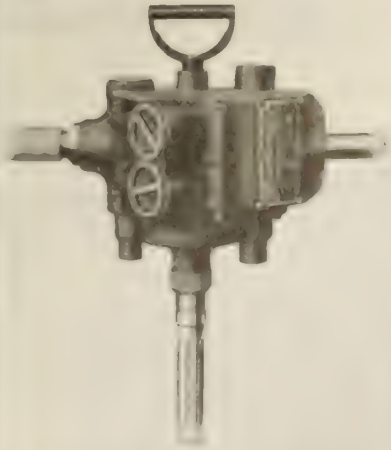
"Fenestra" TRADE MARK

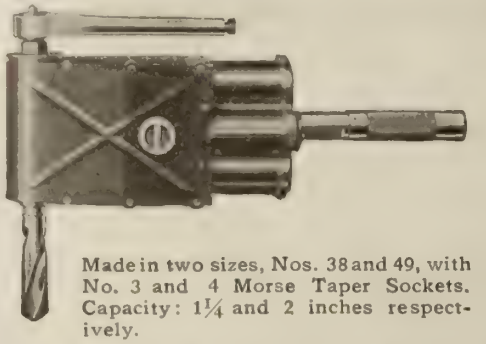
Don't fail to mention "Canadian Machinery" in writing to advertisers.

Cleveland AIR TOOLS

Cleveland Corner Drill

FOR CLOSE QUARTER DRILLING





Made in two sizes, Nos. 38 and 49, with No. 3 and 4 Morse Taper Sockets. Capacity: 1¼ and 2 inches respectively.

¶ Adapted to Drilling and Reaming in narrow places where the Center Spindle Drill cannot be used.

¶ Can drill or ream within 1⅛ inches of side wall or corner.



Riveting Hammers and Chipping Hammers are made in sizes to suit all classes of work and are fitted with either outside or inside latch as prefered.

Cleveland Four-Piston Air Drills are made in sizes to suit all classes of work and furnished reversible or non-reversible as required

Write For Illustrated Catalogue "L"



DUST PROOF

Cleveland Sand Rammers for Floor, Flask and Bench Ramming. Made in sizes adapted to general Foundry and Steel Castings Work

The Cleveland Pneumatic Tool Co.

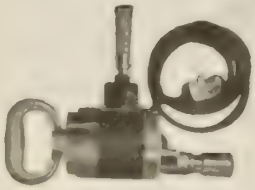
NEW YORK General Offices and Works, Cleveland, Ohio, U.S.A CHICAGO

A. R. Williams Machinery Co., TORONTO, WINNIPEG, VANCOUVER and ST. JOHNS

Williams and Wilson, MONTREAL

U. S. Electric Drills and Grinders

Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.

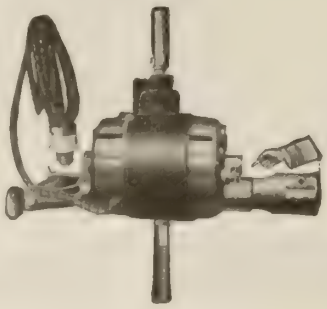


3-SIZES

3/16 inch, W.G.T. 6 lbs.

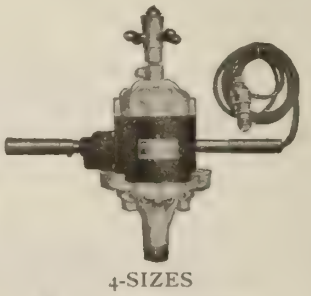
¼ inch, W.G.T. 9 lbs.

⅜ inch, W.G.T. 12 lbs.



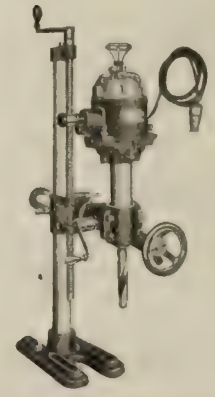
½ inch---2 SPEED

Speed, 400-750 R.P.M.



4-SIZES

⅝ - 1 - 1¼ and 1½ inch.



Portable Radial Drill

Full Universal

2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

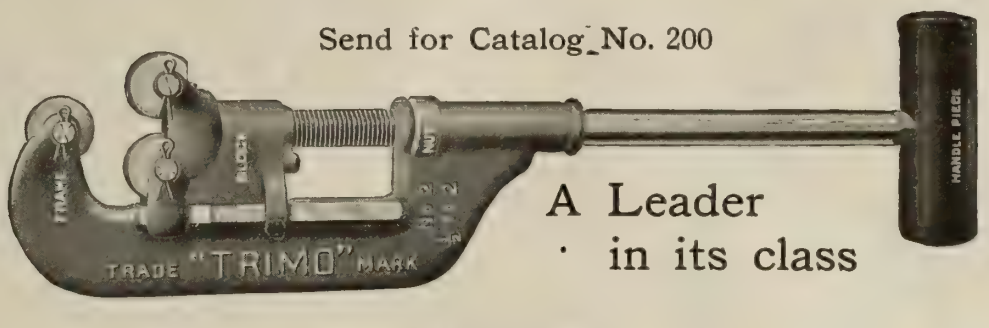
CINCINNATI, - - - - - - - OHIO, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

THE TRIMO PIPE CUTTER

Convertible from a 2-roll and 1-wheel into a 3-wheel cutter.

Send for Catalog No. 200



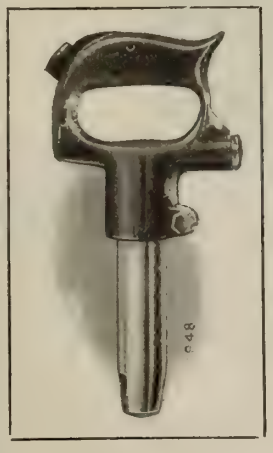
A Leader in its class

MADE BY

Trimont Manufacturing Company

ROXBURY - - MASSACHUSETTS

PNEUMATIC TOOLS

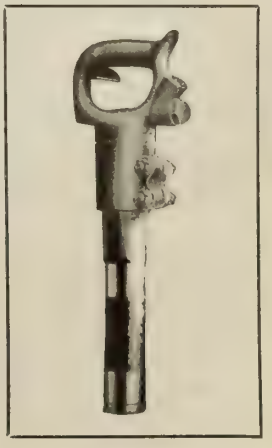


The absolute safety and simplicity of transmitting compressed air, its wide range of profitable uses and the economies effected by its uses, give it an indisputable position of supremacy as a means of transmitting power for operating small portable tools.

Pneumatic tools are not delicate, complicated pieces of machinery, but positively simple, rugged little money savers, made to stand rough usage, yet maintain their efficiency.

In "Imperial" designs wearing parts are reduced to the reasonable limit of simplicity, and manufactured to give the greatest satisfaction.

No part of a plant equipment, representing the same investment, will do more to reduce labor costs, increase output and enlarge dividends than a good pneumatic tool equipment. We firmly believe that "Imperial" tools represent the very best sustained value, first costs, maintenance and operating costs being considered. They are thoroughly well designed, embody all practical up-to-date improvements and give very exceptional efficiencies. These features have won for "Imperial" tools their present favored position.



CANADIAN RAND CO., LIMITED

Commercial Union Building, MONTREAL, Que.

TORONTO COBALT WINNIPEG LETHBRIDGE ROSSLAND VANCOUVER SPOKANE HALIFAX SYDNEY

The PULLEY of TO-DAY---not of YESTERDAY.



The Passing of The Pioneer

Pioneers have to give way to later developments. Every dog has to take his holiday—to pass away into innocuous desuetude, or some such quiet place, wherever it may be. The gist of the argument is that pioneers pass away. Where they go the world little cares. Sometimes they repose in awful places like museums. But the world concerns itself with to-day, not yesterday.

Consider the first railroad train run on the American Continent. In the early thirties it was imported from England and made a trial trip out of Albany, N.Y. The engine was called "The John Bull" and would frighten a staid truck horse of to-day into hysterics, while the miniature coaches would disgrace a respectable cabby if he had to drive them through the back streets. How does such a relic stack up with a modern Canadian Pacific Limited train? Merely a historical recollection.

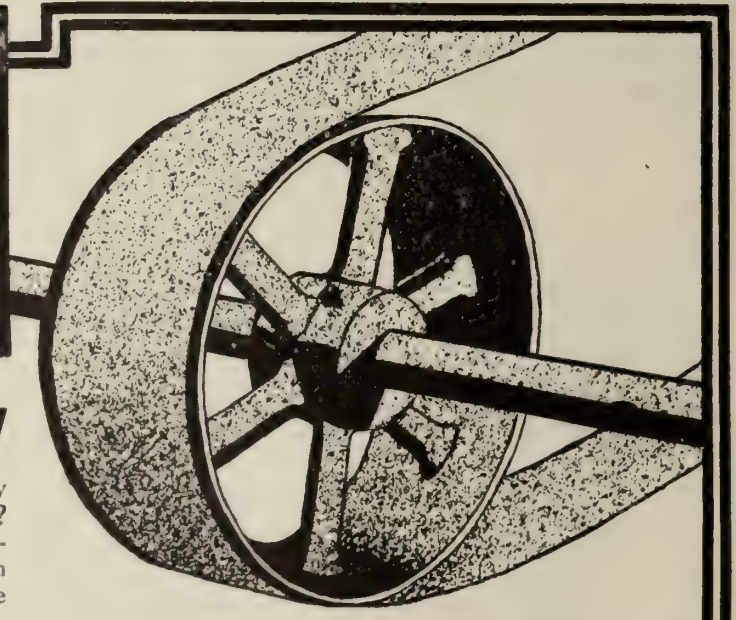
Thus in the pulley field, pioneers are passing away and the POSITIVE Combination Split Pulley is forging ahead, is away in the lead, because it is not an imitation, is different---an improvement, an advancement, a scientific development. It combines the high belt contact of a wood rim with the maximum strength and lightness of steel arms; then the malleable hubs permit of tightening to a vise-like grip without splitting, and the interchangeable cast iron bushings exert a positive compression on the shaft. No two-piece segments are used in the rims, which are waterproofed and have a lignum vitae finish.

The POSITIVE Pulley is in absolute balance, is built right---excels in materials and construction just as much as it does in design. The POSITIVE Pulley is the pulley of to-day, not of yesterday. You keep abreast of the times in manufacturing and you need in your shop the pulley that leads in the world to-day---the POSITIVE.

The POSITIVE CLUTCH & PULLEY WORKS, Limited

American Works, Buffalo, N.Y. TORONTO, ONT.

GOODHUE BELTS



Will Save YOU Money

Why have a large Belting expense account? Why not minimise this expense by using **Goodhue Belts?** They stretch from 15% to 25% less than other Beltings. **The Reason:** We have taken more care in stretching before the Belt is completed—none of the unstretched parts are ever used in the finished Belt.

Goodhue Belts have just the right amount of "Cling" on the Pulley, and the price at which they sell, combined with the satisfactory and lengthy service they give, make Goodhue Belts the lowest in cost on the market.

Goodhue Belts welcome comparisons, and the best comparison is a test in competition with your other Belts. **"Extra," "Standard" or "Acme" Waterproof Belts** suit all the varying conditions of use. Don't pay for belting that will prove an expense—our Belts are the dependable and guaranteed kind.

WRITE US AT ONCE FOR PARTICULARS

J. L. GOODHUE & CO., LIMITED, DANVILLE, QUEBEC, CAN.



THE HEART OF A BABBITT METAL

THE United States Government made a radical departure from orthodox methods when they tested Magnolia, using water as a lubricant.

This test in connection with the tests they made, using oil as a lubricant, furnishes valuable comparative data.

For instance, in the oil test Magnolia showed only 25 per cent. superiority, antifrictionally; but in the water test it proved to be 200 per cent. superior to a high-grade babbitt of the conventional kind, and 1100 per cent. superior to white brass.

This demonstrates that a good lubricant will bolster up to a considerable extent even an ordinary grade babbitt, if plentifully supplied, but when water is used you get at the very heart of a babbitt, and prove its true inherent value. This is worth knowing, because the oil supply gives out sometimes, or the oil holes become clogged, or the quality of the oil is inferior.

Engineers who study these problems will realize that this wonderful showing of Magnolia was due to its very low co-efficient of friction. They also appreciate that a metal that does not become hot is not liable to squash, and wears very slowly.

We lay particular stress upon this quality of Magnolia, because it means safety and economy in every way, and minimizes loss of power.

SOLD BY LEADING DEALERS EVERYWHERE OR BY

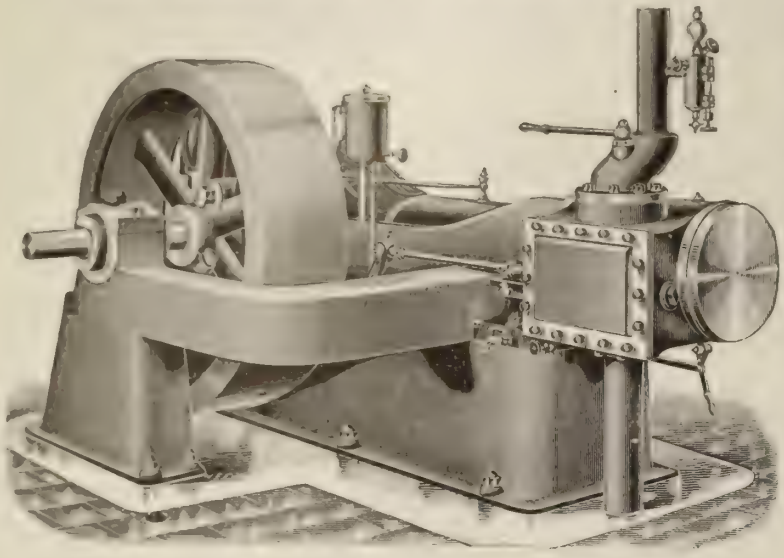
MAGNOLIA METAL CO.

No. 225 St. Ambroise Street, MONTREAL

New York Chicago

SPECIAL OFFER PRACTICAL ENGINEER POCKET BOOK: 680 pages, over 2000 subjects up to date. We do not aim to make a profit on this book, as it is an advertisement, therefore offer it at the very low price of 40c., postage paid. Many engineers pronounce it invaluable. Address Montreal office.

BEARINGS IN LINE



In sizes up to 125 horse-power, the outboard bearing of our side-crank engines is connected to the frame by a wing, keeping the bearings perfectly in line.

These engines are built on the interchangeable system, and duplicate parts are kept in stock, ready for shipment on receipt of order.

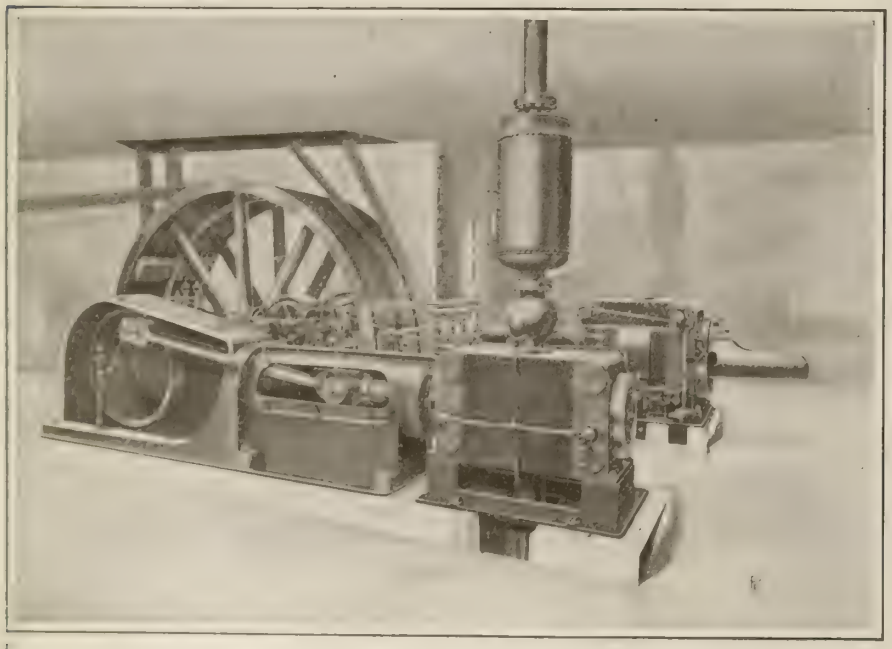
They have our latest improved governor and oiling system and are strictly high class in every respect.

Robb Engineering Co. LIMITED

AMHERST, N.S.

DISTRICT OFFICES

Canadian Express Building, Montreal		R. W. Robb, Manager
Traders Bank Building, Toronto	-	Wm. McKay, "
Union Bank Building, Winnipeg	-	W. F. Porter, "
Grain Exchange Building, Calgary	-	J. F. Porter, "



Cross Compound Goldie Corliss at Cosmos Cotton Co., Yarmouth, N.S. Rope Drive.

Reliability is the most important consideration in the selection of a Power Plant.

Manufacturers above everything else must have a steady day in and day out service.

The only way this can be obtained is by the installation of a HIGH GRADE STEAM ENGINE.

Goldie Corliss Steam Engines give a maximum of service all of the time.

Remember your **Exhaust Steam** does away with

HEATING BILLS

Ask for our Catalog and all Particulars

The Goldie & McCulloch Co., Limited

GALT, - - ONTARIO, - - CANADA.

WESTERN BRANCH
248 McDermott Ave., Winnipeg, Man.

MARITIME PROVINCES
13-15 Dock St., St. John, N.B.

QUEBEC AGENTS
Ross & Greig, 412 St. James St., Montreal, Que.

B. C. SELLING AGENTS
Robt. Hamilton & Co., Vancouver, B.C.

The advertiser would like to know where you saw his advertisement—tell him.

Boilers From Stock



HERE is a list of standard boilers which we are prepared to furnish at once from stock. These are all new. are built to standard specifications, are tested and inspected and are in the best of condition.

RETURN TUBULAR HIGH-PRESSURE BOILERS

3—10"	Diameter	x	10'	Long
4—14"	"	x	12'	"
9—48"	"	x	14'	"
5—54"	"	x	14'	"
10—60"	"	x	14'	"
2—60"	"	x	16'	"
8—66"	"	x	16'	"
4—72"	"	x	16'	"
15—72"	"	x	18'	"

LOCOMOTIVE BOILERS

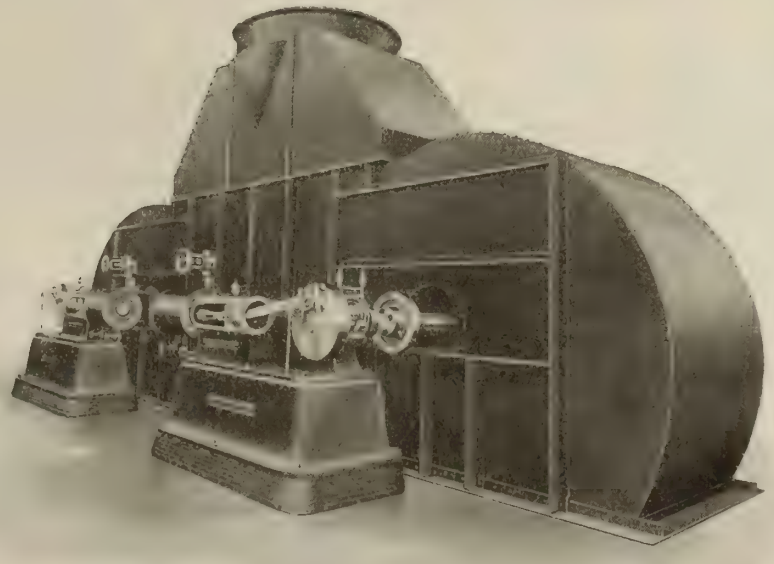
5—30	Horse-Power.	
1—40	"	"
1—50	"	"
7—60	"	"

VERTICAL BOILERS

4—30"	Diameter	x	72"	High
5—36"	"	x	72"	"
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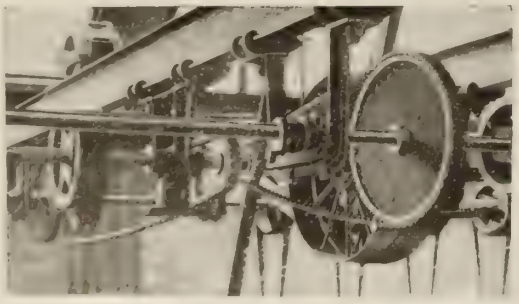
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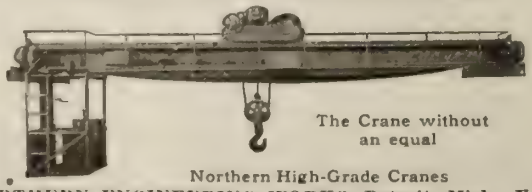
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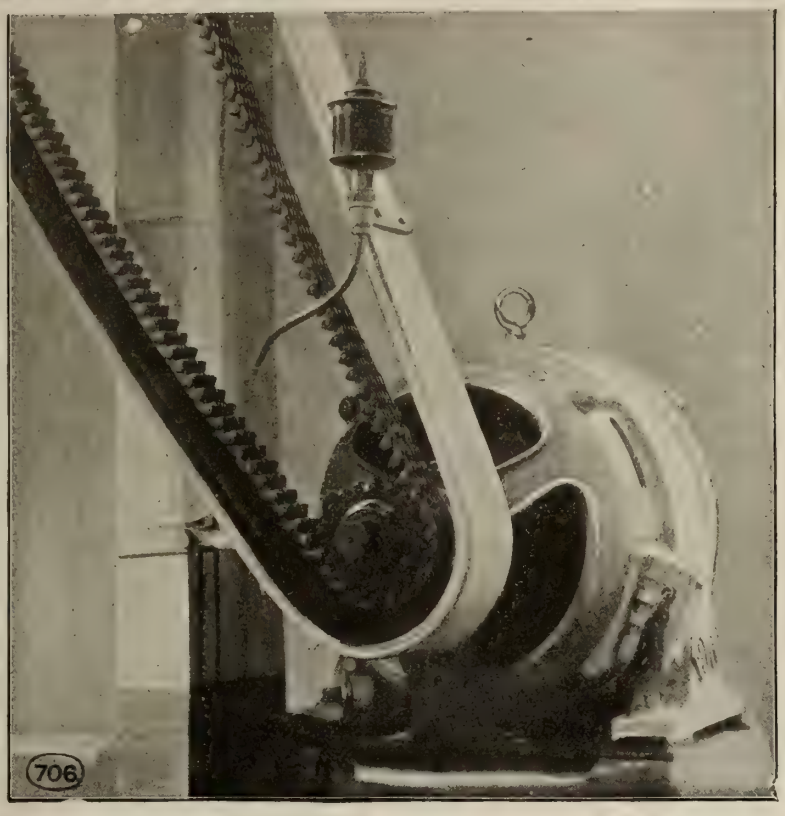
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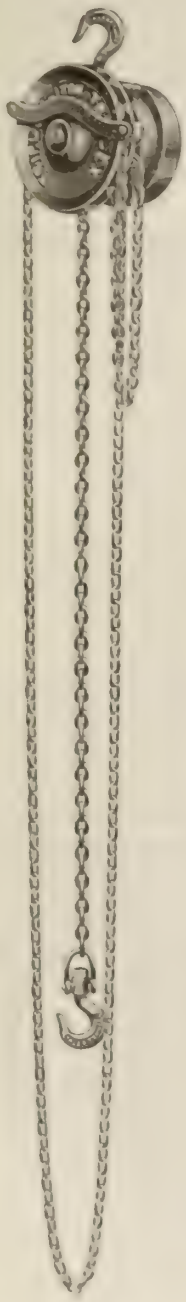
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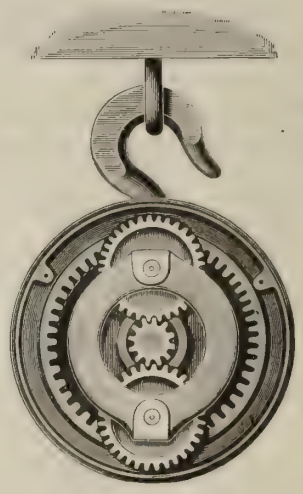
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Process of Manufacture of Lap-Weld Wrought Iron Pipe

By Fred H. Moody, B.Sc.

The Methods Employed in the Manufacture of Wrought Iron Piping are Here Set Forth and Illustrated; Shewing Clearly the Difference in Treatment Adopted, Which Leads to the Two Well-Known Classifications, "Lap-Weld" and Butt-Weld." Users of Both Types of Piping Will Find the Information Instructive and Valuable.

THE Page-Hersey Iron Tube and Lead Co., have two pipe mills, one at Guelph, Ont., producing butt-weld pipe, and the other at Welland, Ont., manufacturing lap-weld pipe. With the process of manufacture of the latter particularly, this article deals.

Butt-weld and Lap-weld.

An explanation of the terms "butt-weld and "lap-weld" is contained in the following brief statement covering the initial preparation of the pipe stock. In the butt-weld, the sheet metal blank which forms the pipe is bent to circular form with edges butted at a welding heat, and afterwards rolled to make the joint. In forming a lap-weld, the edges are swaged before bending,and results with the overlapping of the edges when bent to the circle, in a weld surface of greater area and thickness as compared with the butt-weld. The Page-Hersey Co. make all pipe up to 2 inches diameter by the butt process, and for larger diameters, the lap process is adopted.

Lap-weld Process of Manufacture.

Following the process of manufacture from the beginning, the metal stock is kept in the yard adjoining the pipe mill, and arranged in piles of different sizes. It is called "skelp" and is especially made for this class of work, being rolled to the proper gauge, and cut to the proper width for rolling to the desired diameter with the necessary lap. A traveling crane covers this "skelp" storage yard, and also runs across the end of the pipe mill. One of the crane girders is shown at A Fig. 1. The crane carries the "skelp" in bundles of probably two dozen pieces, and deposits them in the pile B. on fingers extending from the wall which swing from it, and are operated by hydraulic hoist as desired. The car C moves in the same direction as the crane, and when empty, is run under the raised fingers supporting pile B. These fingers drop through openings in car C, and deposit the "skelp" on the car shown at D.

Furnace Mechanism and Operation.

On the right at E is the furnace for heating the plates, and in which a pile of sheets can be seen on close examination. Charging is accomplished by the low charging crane F which has about the same travel as the car C, and in which the operator sits, controlling the cross-travel of both, as also the charging finger. When charging is desired, the charging finger G suspended from a track on the charging crane, is run back, and the car C run up in line with it, the latter being first moved in line with the part of the furnace to be charged. The finger end (hidden by the laborer) is knife-edged to slip between the plates on the pile, and has a shoulder back from the end about eight inches, which engages with the plate and shoves it forward. Three plates are charged in a batch, the finger being then run back out of the way.

Heat is produced in the furnace by a blast of producer gas generated in three large producers located in an outbuilding. Natural gas, which is very abundant and cheap in the neighborhood, was originally used, but had to be given up, as the blast was found to be too sharp and intense. Producer gas, from its lower heat value, is not as sharp, and therefore more desirable. The blast is directed alternately from one side to the other, being changed every half hour, entering one side and leaving the other, and vice versa. The small levers H control this change over, and the large valve I controls the supply, which as shown, can be nicely regulated to meet requirements.

For the next operation a long bar J is attached to the end of the charging finger. The other end engaging with the top plate of the hot pile in the furnace, shoves it out at the end of the furnace A, Fig. 2, and runs it into the swaging rolls dimly shown at B. These swage the edges of the skelp, passing it on further to a table C. The operator on the left, hits the red hot plate in the middle of the end of the skelp bending the corners, so that it will enter the die D. This die consists of two steel castings bolted to the near end of the table C. The dies are formed converging slightly wider than the skelp width at the back, and taper down to circular form at this end. There is a space between the dies wide enough to permit the entrance of the tongs E, which grip the crimped skelp. The hook F of the tongs E is dropped into the endless, slowly moving forward chain G, and draws the hot skelp through the die. As it enters the die, a ball, the internal size of the pipe,is dropped in behind, and is held in place by hook H. The pipe comes through as shown, the edges overlapping, though not together. When completely through, the tongs are removed and the pipe is allowed to roll down the runway I which consists of several pieces of pipe on an easy slope. The other end of these is at A, Fig. 3. The rolling pipe is stopped by the trough B on the car C. The overhead



Fig. 1.—First Furnace and Skelp Charging Mechanism.



Fig. 3.—Second Furnace and Charging Mechanism.

part of the charging crane is stationary, with three running carriages for the charging fingers, one to each of the doors of the furnace E. All the control is from the control box D. The pipe is introduced into the furnace for reheating alternately through the doors on either side, and when heated sufficiently, an operator rolls it over opposite the central opening, through which it is shoved by the middle charging finger, to the welding rolls at the other end, A Fig 4

Rolling and Welding.

The rolls are of cast iron, about 30 inches diameter, turned out to the finished size of the pipe. The top roll is knurled at the bottom of the groove. On the end of the rod B is a chilled cast iron ball C the size of the inside diameter of the pipe. This ball, is run up by the mechanism at D. directly between the rolls, and leaves a space between the ball and roll grooves, of the thickness of the finished pipe. The pipe is now shoved through from the far side into the rolls, which force it over the ball die. The rod B. holds the ball die in place during the operation. Precaution is taken to always have the welding edge uppermost as it passes through the rolls. Thus the knurled face of the groove in the upper die comes on the line of juncture, welding it thoroughly; the small ridges of the knurled surface doing this more efficiently than if plain, and accounting for the knurled line apparent on the finished pipe. During this operation, the section of the metal is reduced to such an extent as to elongate the pipe about two inches per foot.

When completely through the rolls, the rod-moving mechanism at D. is set in motion, drawing the rod from within the pipe and sending it back on other rolls, one of which is shown at E. The die ball is left back at the rolls.

These die balls are frequently scored after operation, and seldom last for more than two dozen pipes, being sometimes useless after even one passage. The still hot pipe in the trough F. is lifted out by fingers on the shaft G. and allowed to roll down pipes H.

It sometimes happens that one passage of the rolls is not sufficient to thoroughly weld, and another passage is required; in which case the fingers I. are swung back, dropping the pipe into trough. By the turntable shown in Fig. 5, the pipe is swung around, so that it may pass through the rolls opposite end on. Rollers in the runback trough J. are set in motion, sending the pipe back to be reheated and re-rolled, both operations being as before described. In case re-rolling is not necessary, as is usual, fingers I. are left as shown, permitting the pipe to pass over the trough J.

Continuing reference to Fig. 5, the pipe passes into trough A; the view clearly showing how this trough is aligned to be central for the rolls by means of screws shown at B. The trough at the welding rolls is similarly arranged, allowing of adjustment to take any size of pipe. To the left is shown the turntable previously mentioned in connection with Fig. 4. for running the pipes back for re-welding where necessary. It is essentially an hydraulic jack which lifts the pipe above the runback trough, and permits of its swinging around end for end. The pipe after leaving trough A. passes through the sizing rolls C. while still hot, which brings it down to exact size, after which it is rolled along a trough on the other side of the sizing rolls till it comes to the cross rolls A. Fig. 6, which are elliptical and are placed at an angle of about twenty degrees with the axis of travel. This gives a rolling, as well as longitudinal motion to the pipe, accounting for the spiral score marks to be found. The pipe which is still a bright red, is given several passages back and forth, after which it is lifted out of the trough B. by fingers in slots C. on to the cooling table, up which it travels slowly by moving chains; being cool enough to handle by the time it arrives at the top, where it is rolled on to a long table. The cooling table is the pride of every operating engineer, and the one shown is one of which S. Hall, superintendent of the pipe mill might well be proud



Fig. 5.—Sizing Rolls Shewing Turn-Table.



Fig. 4. Welding Rolls and Run Back.



Fig. 6.—Cross Rolls and Cooling Table.

From this table the pipes are taken individually and straightened under a heavy press, after which operation, they pass into the machining room, where the rough ends are cut off. The pipe is then threaded and tested under hydraulic pressure. After putting a pipe connection on one end and a protecting ring on the other, the pipes are ready for shipment.

Degrees in Engineering

By Joseph Horner.

THIS article is from the pen of Mr. Joseph Horner, the well-known engineering writer and author, and was contributed in the form of a letter to a recent number of the "Times Engineering Supplement," London, Eng., as a reply to a previous article by Dr. Fleming in the same journal. Mr. Horner gives the factory point of view, and what he says will doubtless be read with interest by a large circle of readers holding like or contrary opinions. Proceeding, he says :

"Dr. Fleming's article raises a question which has long exercised the minds, and even appealed to the sense of humor of the men who do the rough work of engineering. Compare the strenuous life of men engaged in the factory and on public works with that of the class-room. Those whose lives are occupied in these constructive works know well how little real aid is to be derived from pure science beyond elementary principles, with sufficient arithmetic and mathematics to apply those elements to practice. The men who have been most successful, men who possess and know how to apply this elemental knowledge, would not have scored so well, often probably they would have been sad failures, if they had qualified at Universities for degrees before commencing practical work.

Radical Difference of Training.

"The immense and radical difference between the training of the Universities and that of the shops can hardly be appreciated by a University man. It is nearly impossible to do so, because the atmosphere of one differs so totally from that of the other. The engineer who is the product of the text-books is not the man who can construct an engine or machine, or lay foundations, or build a bridge, or run an Atlantic liner, or build up a flourishing business, or rescue a decadent business from bankruptcy. All the rules have to be modified before they can be translated safely into practice.

"The real life of the successful factory is strenuous, the hours are long, there is no such thing as leisurely labor, attention has to be concentrated, myriads of difficulties which are never suggested in any text-book, and which all the text-books written in the world would never contain, have to be met and surmounted with promptitude. Money has to be made ; and a slight difference in the cost of production, and a few pounds more or less in the figuring of a tender, will throw the work into the hands of a rival at home or abroad. Many little economies total up to big aggregates. They include choice of designs, one being probably quite as suitable as another, but the simpler is selected by the experienced manufacturer. They include little economies effected in all the shops —in foundry, smithy, plating shops, and in methods of tooling in turnery and machine shops. It is along these lines that keen firms make money. But no text-book attempts to explain these things, no professor teaches them ; they can be understood, or even appreciated, only by a man who is thoroughly versed in the methods of all the shops which collectively form the engineers' works, which knowledge only comes after many years of close observation and experience.

The Highly Scientific Training.

"The claim is often made that a highly scientific training is necessary to the making of a scientific engineer. By this somewhat vague term is understood the man who is able to scheme and design and complete mechanisms or works ab initio, an originator, a creator. But there are no such men. Every great triumph of engineering is the work of many minds and many men, in which theory has to be brought to the test of practice. We see it going on to-day in aviation ; we are familiar with it in the case of machine tools, of locomotives, of steam turbines, of gas producers and gas engines, and much else. How very small a section of the growth of any one of these is the product of the colleges, how much is due to the men who manufacture ? Granted that the higher education is desirable, and may be necessary for the pioneers in engineering, the great harm which is done by turning out so many young men equipped with degrees is that hopes are raised which can never be materialized, because the supply vastly exceeds the demand. In a works employing a thousand hands not half a dozen such men can find employment. The ordinary draughtsman has no scope for the exercise of that training, neither have the departmental managers and foremen, certainly not the workmen. The students who are turned out of the colleges year by year will be sadly disillusioned as they come to middle age and find themselves occupying very subordinate positions. The effect of this kind of training is already becoming apparent in the unpractical character of too many of the articles which appear in technical journalism, and which are read before the engineering societies and published in their proceedings. Highly mathematical, tediously experimental, they miss the living features which would appeal to the manufacturer whose horizon is, and must be, bounded by the solvency of his firm. Engineering studies are becoming far too academic in character.

Less College and More Shop.

The writer, who went through the mill in the old-fashioned seven years' apprenticeship, thinks that the old training supplemented by short technical courses which were not then available is the true remedy. There must be less of college and more of shop. If the pupils who went through the shops had been privileged to sandwich such short college terms in the period of their pupilage there would not have been so large a percentage of "Wasters" turned out as there unfortunately were. The point is that the permanent set must be taken in the shops, not in the colleges, and therefore professors should be men who have already made a sound reputation in the workshops and on the erection of public works—engineers primarily and professors afterwards. They would then be qualified to teach essentials, to point out the difficulties that arise and explain how they may be surmounted, to deal with the financial side of manufacture as it occurs in a hundred aspects in every department, to put hypothetical cases as in medical examinations, and so test the aptitude or experience or originality of a man. This would develop the faculties that men have to exercise every hour of their lives in the shops.

Standard Lists.

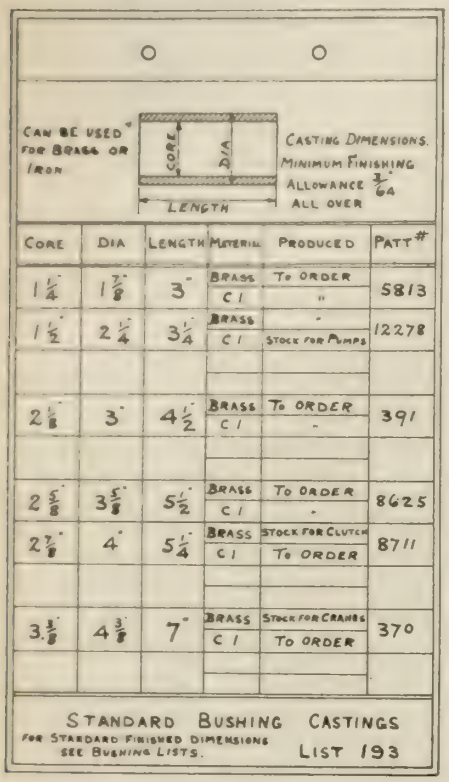
By Harold Smith, Toronto.

THE importance of standardisation must have occurred to manufacturers in the very earliest days of engineering. More especially in the usage of such common articles as screws, bolts, etc., would their minds turn to the possibilities of having a standard thread to obviate the unnecessary delays and expense incidental to so many bastard styles. Finally, of course, as we all know, our ancestors got together and agreed to use a definite standard, with enormous resulting economies. In a similar way almost all large firms are nowadays considering the standardisation possibilities in their factories, by means of which duplicates of small parts may be obviated, and the variety of styles minimized. Standard lists are generally recognized as the most practical way of accomplishing this and maintaining it.

Object of Sample Lists.

Good samples of lists are shown in the accompanying cuts. The object is to

place before the designer in as compact form as possible the particulars of standardised items, so that he may pick out details for which his firm has patterns, tools, jigs, etc., and without which information he is liable to design articles varying in unimportant particulars from what has been already



CORE	DIA	LENGTH	MATERIAL	PRODUCED	PATT #
1 1/4	1 7/8	3"	BRASS	TO ORDER	5813
			C I	"	
1 1/2	2 1/4	3 1/4	BRASS	-	12278
			C I	STOCK FOR PUMPS	
2 1/8	3"	4 1/2	BRASS	TO ORDER	391
			C I	-	
2 5/8	3 5/8	5 1/2	BRASS	TO ORDER	8625
			C I	-	
2 7/8	4"	5 1/4	BRASS	STOCK FOR CLUTCH	8711
			C I	TO ORDER	
3 3/8	4 3/8	7"	BRASS	STOCK FOR CRANES	370
			C I	TO ORDER	

STANDARD BUSHING CASTINGS
FOR STANDARD FINISHED DIMENSIONS SEE BUSHING LISTS.
LIST 193

made, but still sufficiently different to warrant perpetual capital expenditure. This is likely to occur in a large drafting office having several sections dealing with different kinds of machinery; one section being unacquainted with the details of the others. It may also occur in each section over a period of years, as changes of staff occur (due to men leaving) and their successors having no ready means of acquiring the knowledge of what has already been done.

Consider for instance bushings. What a multitude of patterns of all lengths and bores must firms accumulate on their shelves. Also consider that a standardization system would have kept their number down 50 per cent. or 25 per cent. Some of these patterns may be used but once. Standard lists properly looked after will prevent duplication of design as well as create a call for standard parts from all departments. Careful watching will soon show that certain items are in continuous demand, and will enable the storekeeper to order such parts and have them machined in stock quantities, instead of one or two at a time as required. The possibilities of saving in production are obvious. When this stock system has been established, there is a positive connection between drafting room and stores, also the stock carried by the latter is live. Moreover, the amount of money invested in stock will be reduced, as it will be constantly turning over.

Formation of Lists.

It must be fully appreciated that a standard list is not a mere tabulation of all the sizes and varieties that could possibly be used of any article, but a list wherein these varieties are boiled down to the lowest possible number. For instance in the case of studs, it would not effect any economy to have a list running from 2 up to say 6 inches length, by steps of 1/8 inch unless every different length was necessary. The essential idea is to enumerate only those pieces which have been found to be called for right along. Such lists can be started gradually by taking different articles one by one and careful analysing existing designs. Do not make out a theoretically correct list and try to apply it, ignoring all past and existing designs, as this would be expensive and cause endless trouble. Build on what has been done, and eliminate duplication gradually. It will take time and a lot of trouble, but it is worth while. No general rule can be made as to what should be standardised; every firm must judge that for itself. Standard lists of drills, reamers, jigs, gauges, milling cutters, hobs and boring bars can be made in a similar way to great advantage, enabling the designer to make use of existing tackle, and establishing close connection between drafting and tool rooms. Moreover it means that to some extent a job is mentally planned and routed as to operations in the shop before ever it leaves the drawing board.

Standardization and Efficiency.

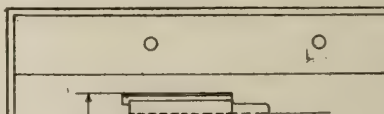
Do not sacrifice standardisation to efficiency, but once established do not depart from it. Additions to list should only be allowed by sanction of competent authority. No firm need think their product too varied for this standardisation of details, in fact such conditions will show up the value of the system most.

Many firms do not have standard allowances for fits in round holes. All holes should be made standard size and outside diameters turned, or according to fit required. This means that reamers, boring cutters, etc., can be kept in tool stores ready for any job. In this way, castings which previously were bored in the engine lathe and finished off a mandrel (because quantity was small and foreman did not consider the expense of a reamer warranted) become a turret lathe job, with resulting economies in production and accuracy.

If fits are allowed for in the opposite way by making outside diameters standard and holes plus or minus according to fit, standard reamers, etc., become impossible, as 3 or 4 of each size would be required, varying only a few thousands from one another. This also applies to gauges. Outside diameters, being produced by lathe or grinder and being gauged by micrometer, do not require different tools for each size. Turret lathes, the most productive machines we have, are too often looked on by the management of a shop doing a general business as too specialized for their work; yet standardisation on the lines mentioned, makes them as sound comparatively for jobbing as for specialized production. Further the tool room equipment in reamers, gauges, boring cutters is not expensive when once standard lists are in use, and their principles embodied in designs before they leave the drawing board.

Standard lists are not a cure-all, but it is surprising how far-reaching are their effects when properly established and maintained, and how many small economies will come naturally and easily from their use.

The writer is intimately acquainted with two large old country firms who have made them features of their factory organization, and both consider them to be the only satisfactory way of economically producing a varied product. One firm manufactures a very large variety of machine tools, and the other a still larger variety of general machinery. Their lists, started in a small way, now run from 300 to 400 sheets, being increased more and more as their utility became apparent.



FOR ARBORS SEE SEPARATE LISTS

DIA	MAKE	TYPE	HOLE	FITS ARBOR
1 1/4"	BROWN & SHARPE	SOLID	1/2" ST.	#251
1 3/8"	" "	"	5/8"	#252
1 1/2"	" "	"	5/8"	"
1 3/4"	PARADOX	ADJUST.	#3 MORSE	#104
1 7/8"	"	"	"	"
2 1/8"	PRATT & WHITNEY	"	#3 MORSE	#104
2 1/4"	" "	"	"	"

STANDARD SHELL REAMERS
LIST 119

The Department Plan of Machine Tool Arrangement*

By C. B. Auel**

A Discussion of the Question of Manufacture on a Basis of Tool Arrangement as Compared With Manufacture on a Basis of Product. Mr. Auel Shows That the Growth of a Large Manufacturing Concern Sometimes Warrants a Change From the Former to the Latter, in Order to Effectually Cope With Orders.

IT WILL be found almost invariably that in the orignial design and layout of small and medium-sized manufacturing concerns, the tool equipment has been so arranged as to group together operations of a like kind, such as milling, planing, drilling, boring, screw machine work, etc.

The reasons for this are:—

(1) That for each of the principal machining operations, there is frequently but a single expert and in order to make the best use of this talent, no other scheme is permissible.

(2) The centralizing of machines of a kind tends to decrease the number required for a given output.

As a result of these there follows logically:—

(3) Accuracy and speed in workmanship.

(4) Uniformity in method.

(5) Economy in floor space.

(6) Minimum distribution of power.

Feeder and Assembly Sections.

Under this method of production, a shop may be said to be divided into two portions, "feeder" and "assembly" sections respectively, the "feeder" sections making the parts from the raw materials and delivering them either to storerooms or to "assembly" sections where they are assembled into the complete apparatus preparatory to test and shipment. There will in general, be a number of "feeder" sections, entirely independent of one another and there may likewise, be one or more "assembly" sections. A production, planning or routing department usually determines the manner in which orders are to be brought through, arranges delivery dates, keeps track of the orders as they progress through the shop and exercises general supervision over production.

The East Pittsburg plant of the Westinghouse Electric and Manufacturing Co. was operated until about three years ago, along lines which may be said to have been departmentalization partly on a basis of tool equipment as outlined and partly on a basis of product, during which time it met conditions fairly satisfactorily. However, in any growing manufacturing concern, there comes a time when the advantages of the preceding arrangement are more than offset by the difficulties incident to its successful operation. The increase in volume of semi-finished parts passing from "feeder" to "assembly" sections, with the accompanying increase of clerical and other work and the multiplication of foremen and superintendents concerned in the manufacture of any one class of product, result in delays and increased expenses of various kinds which cannot be overcome, nor can the recurrence of them be prevented.

Inability to Fill Orders Promptly.

Perhaps the greatest drawback of such a scheme is the inability to fill orders promptly. This is especially apparent during periods of business depression when quick delivery is of larger importance than at any other time. The amount of stock on hand is then usually lowest and accordingly a larger percentage of apparatus requires to be built from the ground up, to fill customers' orders. Under these circumstances, it becomes imperative to place so-called "rush," "forfeiture" and other orders of a like nature in a class by themselves and to conduct them personally, as it were, through the shop. In the doing of this though, other orders are relegated to the back-ground with consequent disastrous results particularly in the matter of dissatisfaction on the part of the customers for whom such orders are intended. Of course, the greater the volume of these special orders, the greater the ensuing confusion and delay in connection with others, so that this method of procedure is not a solution of a difficult problem but simply a makeshift, a temporary expedient, to be abandoned as quickly as some more rational method presents itself.

Another vital difficulty perhaps equal in importance to that already mentioned, is the matter of divided responsibility, no one individual being primarily responsible for any complete piece or class of apparatus. Such being the case, it is exceedingly difficult even to make an attempt to ameliorate or to improve conditions which are known to need attention, for the reason that there seems to be no proper place at which to commence the betterment work. As a result of these conditions and without going any more minutely into an analysis of the difficulties, it is reasonable to assume that in consequence of shipments being delayed and responsibility divided, "work in progress" and "stocks, raw and finished" will be high.

Factory Departmentalization.

Recognizing that methods of manufacture which had in the past been satisfactory for their needs, were, for the reasons already stated, proving inadequate to handle the increasing volume of business, the Westinghouse Electric and Manufacturing Co. spent considerable time in investigating the methods of other large companies in similar lines of business, with the result that it was deemed advisable to modify the original scheme in favor of so-called "factory departmentalization"; that is, to divide the plant into a number of separate units, as self-contained as the nature of the work of each would permit; in other words, to treat the units like independent factories, housed together under the same roof for mutually advantageous purposes, yet buying from and selling to one another their various commodities as circcmstances made desirable. A scheme of this kind naturally causes a number of duplications of the organization and equipment. While this is so, it does not necessarily involve any material increase in either, since the change is more in the nature of a re-arrangement of the existing equipment and organization, with the addition here and there of a few tools which under the original plan, were used in common by two or more departments. Even this may to some extent be avoided by assigning such tools to the department requiring them most and permitting the other departments to have their work done on requisition.

In introducing this scheme in the East Pittsburg works, it was deemed advisable as a precautionary measure to put it into effect in but one department only, further progress along this line to be dependent wholly upon the results obtained. This was accordingly done and with very gratifying results, almost from the very commencement. It was found as anticipated that among other advantages, shipments were facilitated and "work in progress" and "stocks" decreased to a very marked degree.

Comparison of Plans.

Comparing the routine in this particular department under the original and the modified plans, in the former the work was performed by 22 sections located in 13 independent departments: in the plan as modified, the same work

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* Paper read at the National Machine Tool Builders' Convention, Atlantic City, May, 1911.

** Asst. Works Manager, Westinghouse Electric & Mfg. Co.

is now done by 13 sections in 7 independent departments. This, however, by no means emphasizes the difference even in the routine, for the reason that under the modified plan authority for an entire line of product is vested in a single individual, who therefore, is enabled to exercise his discretion as to the raw and partly finished items to be carried. By a judicious selection of these, he has at all times a certain amount of stock on hand and is thus to a large extent not dependent in the matter of deliveries on the other sections outside of his authority which supply him with materials.

As a consequence of the excellent showing made in the department selected for trial, departmentalization was gradually extended throughout the plant until now the work has been almost completed. Though not yet perfected, the general results have been a confirmation of those obtained in the department in which the scheme was first tried.

Departmentalization Not Always Practicable.

It is hardly practical to carry this departmental idea into all sections; for example, in the pattern shops and foundries, or in certain other places where either the work or the equipment is very special; neither has it been deemed wise to include disc grinding or polishing on account of the deleterious effect of the dust and fumes on other machines in the vicinity, though certain work of this kind is being done in some of the departmentalized sections where facilities for carrying off the dust and fumes have been provided.

As at present arranged, there are in the Works eight fairly self-contained departments as follows:—

(1) Railway, Mining and Crane Motors.

(2) Power—for large generators and motors.

(3) Control—for railway and industrial control apparatus.

(4) Detail—for switchboards and accessories.

(5) Small Motor—for small power motors.

(6) Transformers.

(7) Locomotive.

(8) Industrial—for medium size motors.

Besides these, certain "feeder" sections still continue: coils, punchings, blacksmith, cabinet and pattern-making, screw machine, foundries, etc.

With respect to the screw machine section, it may be stated that this has been departmentalized to some extent, though the greater portion, for the manufacture of such parts as are made in large quantities and carried in stock by the central stores remains unchanged. Regarding the other "feeder" sections, it is possible that some of them may in due course be departmentalized, without necessarily changing their present geographical location; but simply by assigning a certain proportion of the floor space and the tool equipment in each, to each of the already departmentalized units.

Advantages of Departmentalization.

The results obtained in the other departments have been as already stated, but a repetition in greater or lesser degree of those in the department where the modified plan was first tried out. Summarizing the various advantages they may be said to include:—

(1) Centralizing of authority in the production of each class of apparatus.

(2) Decrease in time required to fill customers' orders.

(3) Increase in output in a given period.

(4) Decrease in "work in progress" and in "stocks".

(5) Saving in floor space.

(6) Decrease in handling of materials.

(7) Decrease in clerical labor.

(8) Decrease in indirect expense in overhead burden

(9) Increase in individual initiative.

(10) Healthy competition between similar sections and departments.

In the matter of accounting, departmentalization has been carried even further than it has with the manufactured products, for every part of the works whether a "feeder" section or a complete department, is now self-contained in this respect, giving a total of 53 such units in all. These being comparatively small, permit the ready compilation of the transactions of the preceding month, so that all inter-sectional and inter-departmental accounts are therefore balanced on a monthly basis. A further advantage of this feature is that each unit has its own percentage of indirect expense or overhead burden, figured on its total productive labor which percentage is changed from time to time as circumstances seem to warrant. Order costs are compiled by the "feeder" sections and departments themselves. It may be stated that it is not the aim to show either a profit or a loss in any of the sections or departments, so that when either of these conditions arise, the overhead percentage is altered accordingly. Every month each of the units in the works is provided with a set of charts or curves giving a continuous record of its performance in total productive labor, total expense labor and total expense materials, the expense items being also segregrated along various helpful lines, all shown directly in dollars and cents and many as a percentage of total productive labor as well. This percentage is considered as a measure of the expense labor and material efficiency.

Scope of the System.

Regarding systems of wage payment, day work, piece work and premium work are all used, in the proportion at the present time of 35, 14 and 51 per cent. respectively. Time limits and piece work prices are set by duly qualified experts and only after careful consideration of all the factors involved. In determining these a base is first set which base is assumed as the time required to do the work by the average skilled workman working regularly as he ought to work. To this base time an incentive is added depending upon the class of work, surrounding conditions, prevailing day rates in the district, etc., which total time then becomes the time limit in the case of premium work; or from it is figured the piece work price where piece work is used. Upon the completion of each job, the actual time taken is compared by the time clerk with the base time and if the former is in excess, the matter is further investigated. In one of the departments, all time slips in each section at the end of each pay are totalled twice, first, with reference to base times, second, with reference to actual times; the ratio between them being the efficiency of the section as far as productive labor is concerned. This scheme applied to a workman's time slips, will likewise give the individual efficiency and was originally so used it is believed, by Harrington Emerson. It is possible the scheme may be applied generally in due course.

Departmentalization on the basis of product has likewise been extended so as to include the engineering and to a somewhat lesser extent the sales correspondence departments; in fact, in certain instances the engineers and the correspondents are located alongside of one another with the result that much of the routine work in connection with orders is facilitated.

In conclusion it will be appreciated that in what has been said within the limits of this paper, only the barest outline has of necessity been given of a few of the present methods of working of the Westinghouse Electric and Manufacturing Co. from the viewpoint of departmentalization on the basis of product. It is not intended in any sense to convey the idea that this method of operating a large and growing manufacturing concern is the only correct way; but, from the experience of our company, it is quite evident that it is the best method for its particular needs. No general statement can be made as to when it would appear advisable for a similar concern to change over from manufacturing on a basis of tool equipment to manufacturing on a basis of product, as experience alone would seem to be the guide.

Machine Shop Troubles, Happenings and Improvements

By Blackrock

Affording an Opportunity for Readers to Keep in Touch With What is Being Said and Done by Their Confreres. A Record of the Light That is Being Thrown on the Elements of Design, Constructional Detail, and Operation; the Daily Troubles Arising, the Difficulties to be overcome, and the Remedies Suggested.

TWIST DRILL GRINDING.

By H. N. Harding.*

I PROPOSE to first take up the grinding of the different kinds of twist drills, stating the grain and grade of wheels that have been found to be best suited for the work together with the results of various tests that have been made.

As the ordinary carbon steel drill is perhaps the most frequently seen and used, we will consider this first.

There is ordinarily from .020" to .025" stock remaining on the part of the drill to be fluted and from .010" to .015" on the shank if it is tapered, when the drill comes to the grinder from the lathe. The first operation is the roughing of the part of the drill to be fluted removing from .008" to .010" to a limit of from .002" to .003." This operation is necessary that the drill may be held securely in a bushing to be fluted, and you will readily see that as a good finish is not necessary, the wheel best fitted for this work is one that will remove the stock quickest.

It has been found that the 24 combination L wheel is well fitted for this work—fifty-eight 1 1-16" drills being ground in an hour, .010" to .012" stock removed to a limit of .001". The 24 combination M wheel is also used on this class of work.

I have found personally that the tendency of the operator is to use the hard wheel because he says it "stands up" better and he does not have to true it so often, and this by the way is a thing that the average operator seems to hold as a last resort.

A little aside from the subject, but I had an experience recently that illustrates the point very well. I called at a certain factory to start a machine and found that while they had been running it for a week, the operator could not remember that they had trued the wheel more than twice. When I trued the wheel twice for every arborful (they were grinding piston rings) they said they thought it would wear the wheel too rapidly, but as the time was more then cut in two, they thought is "helped some."

To return to the subject: the next grinding operation is the finish grinding of the flutes and shanks of the hardened drill. This is really two operations, but where two machines are operated by one man, one is set up for grinding the flutes and the other the shank.

I have personally found that the 24 combination K wheel gives the best results on the flutes. For this work a 14" x 2" x 5," 60-80, grade K, has also been used and sixty-six $\frac{1}{2}$" drills per hour, thirty-two $1\frac{1}{4}$" drills per hour and twenty-one $2\frac{1}{4}$" drills per hour have been ground complete, meaning both flute and shank; one operator running two machines, one on flutes and one on shanks, removing .008" to .014" from the flutes and .010" to .015" from the shanks to limits of .0025" variation in diameter, and 1-32" to 1-16" in length of shank. A 1-4" x $1\frac{1}{2}$" x 5", 60-80-M wheel was used in grinding the shanks.

Regarding the grinding of high speed steel drills it has been found that a little more than two-thirds of the work can be done on high speed steel that is done on ordinary carbon steel. This is borne out by the fact that with one operator running two machines with .010" to .015" to remove from the flutes and .010" to .012" to remove from the shanks, forty-five $\frac{3}{4}$" high speed steel drills were ground in an hour to a limit of .0005" in diameter and 1-32" variation in length of shank. A 24 combination L wheel was used for this work.

I have noticed that in finish grinding the flutes where finish is quite an important feature, that if the wheel is too hard the work will show a burned appearance just where the fluting stops, due probably to the fact that the wheel has become glazed or is trued too fine, and while it cuts all right on the flute where there is a clearance for the wheel, immediately it comes in contact with the full diameter of the stock, the pressure of the wheel on the work is greater and therefore this part of the drill will be burned.

I have purposely left the grinding of flat twist drills until last because we have had less experience with this line than the others. They are much harder to grind as a rule, for the material is such that if it is overheated during the grinding process the edges of the drill will check and crack and the drill will probably prove worthless. We ground some of these drills at the factory some time ago, the grinding being witnessed by the customer's superintendent. After grinding these drills were subjected to a test of being dropped a distance of four feet to a cast iron block. These drills were straight shank drills and in the test mentioned 1-16 in. stock was removed from the diameter of the work to a limit of .0005 in. at the drill point. One operator ran two 6x32 in. machines with the following result:

No. of Drills.	Diam.	Time.
48	9-16 in.	1 hr. 48 min.
27	5-8 in.	1 hr. 15 min.
20	$1\frac{1}{4}$ in.	2 hrs. 15 min.

(Two drills broke in each of the above tests.)

In another instance, twenty-five $\frac{5}{8}$ in straight shank flat twist drills were ground in one hour, removing $\frac{1}{8}$ in. of stock to a limit of .0005 in. at the drill point, one operator running two machines. The wheel used in this case was a 24 combination M.

* Norton Grinding Co., Worcester, Mass.

TESTING BABBITT METALS.

AN elaborate test of six samples of babbitt metals was recently made in England by a professor of engineering, assisted by a metallurgist, and was published by a prominent engineering journal occupying six columns with charts, tables and photographs. They gave the formula of only one of the metals; a "genuine babbitt," and were apparently satisfied with the statement that the other five samples contained varying proportions of lead, or words to that effect. It is fair to presume that these five samples were simply an ordinary batch of babbitt metals of different proportions of lead, tin and antimony and perhaps a little copper.

Purpose of Test.

The test was made for compression, tension, hardness, bending, impact and micographic. The summation of the test was expressed in the statement that all the samples withstood a greater stress than would likely have been put upon them in actual service. They did not give out a single test showing the anti-frictional qualities of these metals or the comparative values from the co-efficients although the gentlemen conducting the test must have appreciated the value of such figures and also of giving formulas by which comparative figures would show the relative values of the different compositions.

Anti-Frictional Qualities Overlooked.

They must have had some message to give out to the public in having made and published this test, but we doubt if its value will be apparent to the ordinary layman for lack of details regarding the metals. Had this information been supplied it would have been interesting and instructive as far as it went, but any experienced babbitt man knows that mere hardness in a babbitt metal expresses only a comparatively unimportant phase of the conditions to be met and are requisite in practical use. In fact, the very ingredients that harden a metal if used beyond a certain quantity, impair its anti-frictional qualities and it is therefore more liable to heat and run out of the box. The average shaft is so designed that it rarely, if ever, imposes upon the bearing a greater weight than it can safely sustain; in fact there is usually a large factor of safety, as the ordinary babbitt under compression test will sustain a weight of four or five tons per square inch.

What is it then that ordinary mortals want to know or ought to know about babbitt metals? Is not the whole story that is worth while told by a test that shows the comparative values of babbitt metals from the co-efficients? It certainly ought to be, if the tests are made properly, for such tests will of necessity show the value and capacity of the metals under varying loads and speeds up to their maximum capacity. Such tests should also be made with lubricants of different viscosities and also with water as a lubricant, if metals will stand the water test—for it is well to know how a metal will perform in case the oil supply gives out or the oil holes becomes clogged. Lubricants, particularly of high viscosity, interpose a thin film between the shaft and the bearing and will bolster up to a considerable extent a very ordinary babbitt, but when you come down to the water test, you get at the very heart of things and it will give you the true basic anti-frictional values of the metals tested. It is a case with babbitt metals of in aqua veritas.

Babbitt Troubles.

Probably 90 per cent. of babbitt troubles are due to frictional heat, sometimes complicated by initial heat and if a metal lacks anti-frictional qualities, what availeth it to be hard, as hardness will not prevent it from heating and squealing, in fact it will run out of box much quicker than will an anti-friction metal that might show considerably less sustaining powers under compression test. There is a great deal of misinformation on the subject of mere hardness in babbitt metals and there are engineers and mechanics who still form their opinion of a babbitt by whittling on it with a pocket knife. It is axiomatic that if a metal heats readily it is due to frictional resistance and that frictional resistance is caused by the interlocking and tearing apart of the two surfaces in contact. This waste of power causes a greater consumption of coal, lubricants and metal; it necessitates more frequent rebabbitting, and there is the liability of "shut downs" and overloading the boilers.

The economics and safety from using a high grade anti-friction metal on all bearings are so apparent that it would seem unnecessary to offer any argument in its favor or to point out that it is poor economy to use an ordinary grade babbitt merely because of the initial saving in cost. Where accurate figures are kept in a factory of all items of expense, it will not take long to demonstrate the economy and other desirable features of using a high grade anti-friction metal that will show a low co-efficient of friction particularly if it will stand up under a water test.

Description of the Gardner Crank-Pin Turning Machine

From "Engineering"

The text and illustrations refer to a specially designed tool for the rapid and accurate machining of crank-pins. The designers being under the necessity of using large numbers of cranks for gas and oil engines, experimented largely, and as a result this tool was evolved, giving results which completely justify, they think, the time and money spent.

The chief principle involved in the method adopted in this new machine is that of actually "forming" the crank-pin by means of a tool the full width of the crank-pin. To render this method of turning possible a positive drive, as close to the crank-pin as possible, is absolutely necessary, and this is one of the features of the design. A general perspective view of the machine is shown in Fig. 1, while Fig. 2 shows a crank in position. Figs 3 and 4 are two views of a crank, with reference letters for dimensions.

Detail Description.

It will be seen that the headstock drum or spindle carries on its outer end a large helical gear-wheel, which is driven by a pinion on the end of the main spindle of the gear-box. The main drive to the machine consists of one pulley only, 16 in. in diameter, for a 4-in. belt, the pulley running at 350 revolutions per minute; all speed variations are obtained from a system of gears carried in a gear-box mounted on the headstock. This gear-box gives eight speed-changes, arranged in geometrical

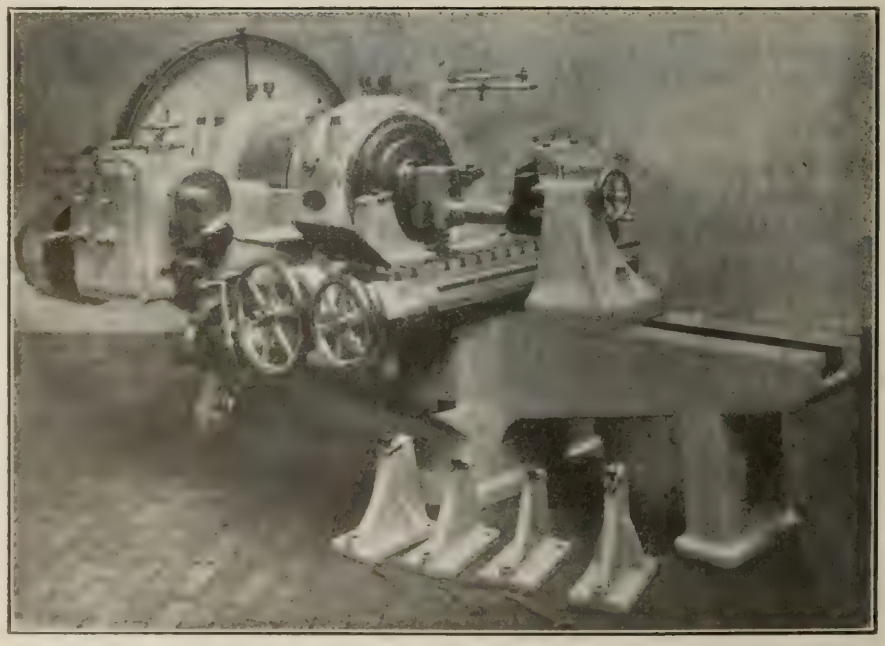


Fig. 1. Crank Pin Turning Machine.

progression, the speed-changes being obtained by means of interlocking levers; these levers prevent the possibility of two speeds being simultaneously engaged. All gears are of ample width and diameter, and have carefully cut teeth of special shape to ensure quiet running, and they run in an oil bath. As

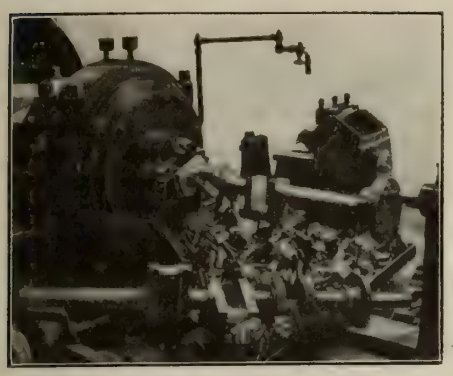


Fig. 2.—Crank Pin Turning Machine.

will be seen by Fig. 1, the headstocks are carried on a strong bed of box section, the interior of which is used as an oil-well for the cutting-tool lubricant; provision is made for returning the oil to the well after leaving the tools.

The headstock of the machine has a large hollow spindle carefully and accurately fitted; this spindle is actually a drum, large enough in internal diameter to accommodate the end of the crank-shaft, when fixed eccentrically to the extent of the required throw of the crank. On the face of this drum is mounted a special chuck, which fixes positively the exact throw of the crank; the crank-shaft itself is supported in the chuck close to the web, and at the other end, inside the spindle, by a special steady disc which can be moved to any point to suit the length of the crank. In addition to this the crank is further held by the web by means of clamping screws on the face of the chuck, thus eliminating all torsional vibration of the crank-shaft itself. The method will be best understood by reference to Figs. 1 and 2. The overhanging end of the crank-shaft is supported by means of a small following headstock, as shown in the illustrations.

The machine is provided with a specially long cross-slide, and on the front end of this is mounted a tool-holder, which carries the roughing tool. A second tool-holder, carrying the finishing tool, is mounted behind the crank-pin, so that the turning operation can be entirely removed without removing either the crank or the tools. In addition to the "necking" tool-holder a "crowning" rest is provided, fixed at the back of the cross-slide, for the purpose of topping or crowning the ends of the crank-webs. Both the cross-slide and the crowning rest have the necessary automatic feeds. For "crowning" the webs the crank is held in the same chuck as for necking; but to obtain its correct radial position for this operation, a second hole in provided in the chuck to receive the crank-shaft. A pump is fitted for feeding the lubricant to the cutting tools; this is driven from a separate constant-speed shaft on the gear-box, and a continuous and uniform supply of lubricant is secured at all speeds of the machine. Generally, the machine is of massive and strong design, and it is claimed that the work obtained by it is greatly superior to that produced by any existing method of machining crank-pins, both as regards quality of work and economy of labor.

Performance and Features.

In the table are given a few examples of cranks turned by the machine, and the time required for machining in all cases the time given covers the complete operation of fixing, machining, and taking the crank pin out of the machine when finished. At present the makers are listing one size of machine only with a barrel of 15 in. internal diameter; the maximum capacity is determined by adding the throw of the crank to half the diamater of the shaft. This sum must not exceed $7\frac{1}{8}$ in.

The chief features claimed for the machine are perfect alignment of crank-pin with the crank-shaft; pins finished round within a maximum limit of error of 0.0005 in.; perfect control of the finishing tool; and diameter of crank-pin accurately controlled by large graduated disc on the feed-screw. Once the disc is set, the correct diameter can be reproduced any number of times without actual gauging. There is reduction in labor charges. The machine is adaptable within the capacity of the barrel. Multiple-throw cranks can be machined as readily and expeditiously as cranks with a single throw.

Each machine is sent out complete with the fallowing parts:—Three "roughing" form tool-holders, three "finishing" form tool-holders, one "crowning" tool-holder and tool, one tool-grinding gauge, and all necessary spanners and accessories. A complete equipment of tools for machining one size of crank is supplied with each machine. This equipment consists of the following parts:—One crank-chuck, one crank-pin roughing tool, one crank-pin finishing-tool, one supporting dog, and one steady disc. The net weight is about four tons. L. Gardner & Sons, Barton Hall Engine Works, Patricroft, Manchester, are the makers.

HOW THE AIR BRAKE FIRST WAS USED.

The air-brake, writes Paul Latzke in Everybody's, was ushered into actual use in most dramatic fashion. The trial trip occurred in April, 1869. The train selected was the Steubenville accommodation running between Pittsburg and Steubenville, Ohio. When the train was going at full speed, suddenly, as he came around a sharp curve, the engineer saw a stalled wagon in the middle of the track dead ahead. With hand-brakes only, nothing could have prevented a terrible smash-up. The formal time for the trial of the air-brake had not come, but the brake was there, and in desperation, not believing for a moment that the thing could possibly avail, the engineer threw on the air. But it did avail. The observers in the rear were almost catapulted out of their seats by the shock of the sudden stop. But when they saw the engine fairly poking its nose into the wagon-bed, so narrow had been the margin between safety and disaster, they forgot all about their shock and stood in awed silence.

Lard oil is now the standard material for use in coating the cast iron molds used for casting brass for rolling. It should be of the best grade and free from mineral or vegetable oils. Fish oil was used for many years, but the smell is objectionable. It gives equally as good results, however, as the lard oil.

Gold is the most malleable metal, but the presence of as small an amount as 0.0003 per cent. of antimony will cause it to crack in rolling.

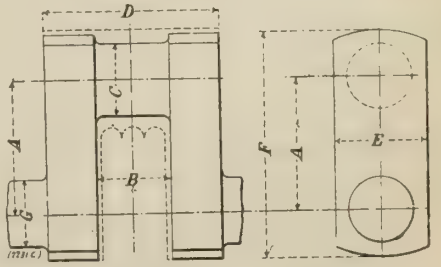


Table I.—*Time Taken to Turn Cranks, as in Figs. 3 and 4, on 15-In. Crank-Pin Machine.*

A.	B.	C.	D.	E.	F.	G.	Crowning Time in Minutes Each.	Necking Time in Minutes Each.	Total Time.
in. $5\frac{1}{4}$	in. 3	in. $2\frac{3}{8}$	in. 7	in. $3\frac{3}{4}$	in. $9\frac{1}{4}$	in. $2\frac{1}{8}$	8	25	33
$3\frac{1}{4}$	3	$2\frac{1}{2}$	7	$3\frac{1}{4}$	7	$2\frac{1}{2}$	7	22	29
$3\frac{1}{2}$	$2\frac{3}{4}$	2	$6\frac{1}{4}$	$2\frac{3}{4}$	$6\frac{1}{4}$	2	5	16	21

The times specified include setting and all other operations.
The dotted line shows the state of the crank-neck before turning, after the slab has been removed from between the webs by drilling and slotting in the usual way.
The machine is quite capable of turning the crank-neck from the solid forging, but it is found quicker first to remove the slab, instead of making chips of all the metal which has to be removed.

Fig. 3 and 4.—Crank Pin Turning Machine.

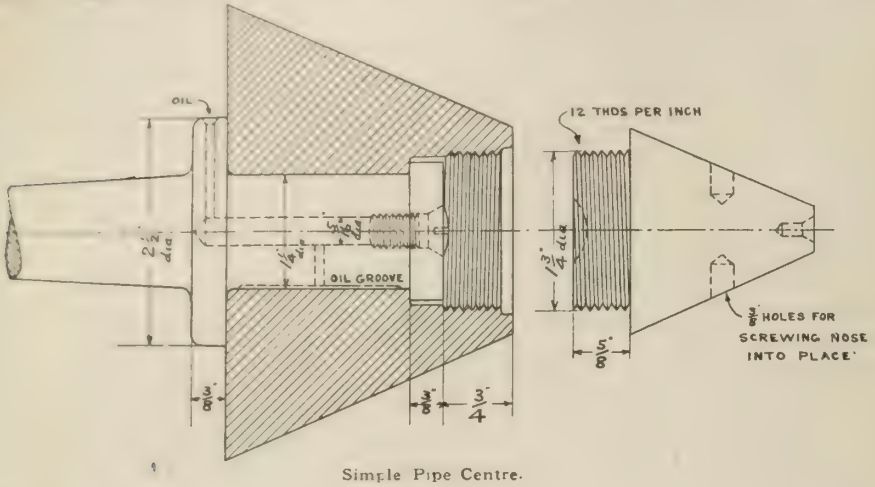
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

A SIMPLE PIPE CENTRE.

By J. C. M.

A pipe centre that has the advantage of not coming off the spindle when the pipe is removed, is shown in the attached cut, which is self-explanatory. The cone may be of any desired dimensions, and means for thorough lubrication of the spindle should be given careful attention.



Simple Pipe Centre.

The best way to make this centre is as follows:—First, form the male and female screw threads, then bore out the large part of the cone and make the spindle a tight driving fit. Screw on the nose, and turn cone to required size. Remove spindle and ease it until cone revolves readily without play. The spindle shank is made to fit into the lathe tail-stock spindle. The apparatus might be somewhat improved by having a vulcanized fibre washer between the cone and the spindle collar.

STACKING MOTOR ROTORS.

By A. Mitchell.

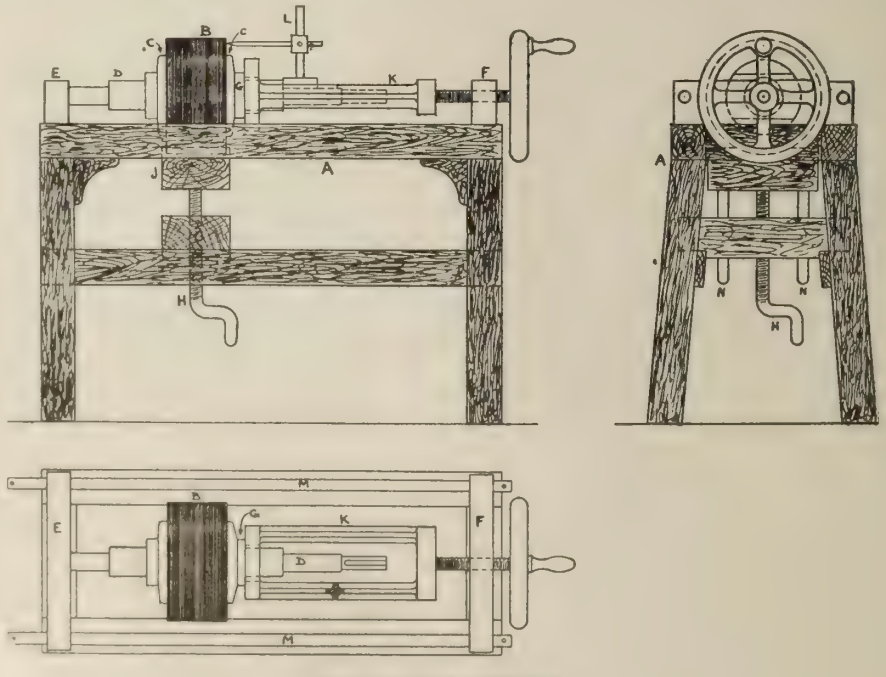
This press is used for pressing together the laminated iron plates that go to form the core of a motor armature, when they are placed on the shaft without a spider, and is of simple design, as may be seen from the cut.

A is a wooden frame supporting the press, etc. B, the core or rotor consisting of iron disks about 0.1" thick. C C are cast iron flanges. D is the motor shaft. E is iron block against which the end of the shaft bears. F is a similar block forming a seat for the screw.

After the plates have been assembled between the flanges, a ring C is heated and placed in position. A yoke or collar K, which may be of aluminum for lightness, is then placed over the end of shaft, so that one end bears against the shrink ring A. The screw is brought to bear against the other end of the yoke and pressure applied until the rotor stands exactly central with the shaft journals. A surface gauge L placed against the end of the journals tells when this has been accomplished. When the shrink ring cools the rotor will be held firmly in position. It is important that it be exactly central, otherwise the pull to one side will cause excessive friction on one journal shoulder.

The rotor and shaft are supported by the wooden block J, which can be raised or lowered by the screw H, to suit the various roter diameters. The block J is guided vertically by two rods N working in holes in the lower bar which forms the nut for screw H.

MM are rods of cold rolled steel which take the thrust, and are about 1 inch diameter. Pins through the rods serve to adjust the length of the press to suit different lengths of motor shafts. The block J with its screw and nut can also be moved along the rail to any required position.



Rotor Stacking Apparatus.

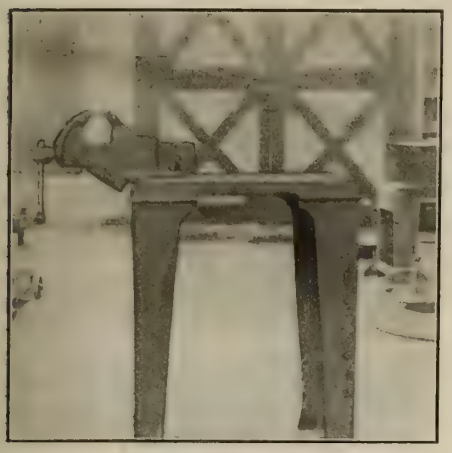
INCREASED VISE FACILITIES.

By Don. A. Hampson.

Some time ago, a writer in Canadian Machinery spoke of the need of increased vise facilities, with particular reference to having same close to the work. There is no doubt as to the advantage of having vises accessible to machine and floor hands, and the portable tool is doing much toward this end. In our general machine department, the vises were bolted to the wall benches, making it necessary for floor, milling and planer men to walk from 20 to 50 feet every time they had to do a little filing or chipping (often several times an hour), this cut deeply into the day's production.

Reference to the photo shows the style of vise-stand we built to save this wasted time. The legs are a heavy stock casting as is also the top and these we combined as shown, putting in a stiffening rod at the bottom, and mounting

with a vise. Such an outfit takes care of anything a man can put between the vise jaws without its sliding around on the floor. When desired to move it, a shop truck is slipped under one leg. The top is planed, making a rough surface



Vise Stand

plate as well as a place to lay tools and work.

INTERESTING PIECE OF FORGING WORK.

By J. H. W.

Cast iron wheel centres for locomotives have never been looked upon favorably in European practice, and until the advent of steel castings, locomotive wheels were always forged of wrought iron. This was a job requiring much skill and care. The wheelsmiths were generally men who had grown up in the trade, consequently the reliability of the work they turned out and the smoothness of its finish, was remarkable.

The cut shows diagrammatically how the wheel was made. The spokes A were forged separately, while the rim was forged in small segments B, one such to each spoke, Fig. 1. These rim pieces were then welded to the spokes, as shown in Fig. 2. Another common practice was to forge the upper half of the spoke solid with the rim and afterwards weld on the other half spoke. The pieces shown in Fig. 2 were arranged in a circle, Figs 3 and 4, and clamped together.

One side of the wheel centre was then raised to a welding heat, and a thick disk or washer, C, Fig. 4, was similarly treated in another fire, the two being afterwards welded together, as were the spoke ends next the centre at the some time. The other side of the centre was treated in like fashion, on completion of which the wheel appeared as in Fig. 5. The next operation was to complete the rim by welding in wedge-shaped pieces at each gap, as shown in Fig. 6. An alternative method of doing this is illustrated in Fig. 7.

Fig. 8 shows a section of the completed wheel, ready to be faced, bored, turned and have the tire shrunk on.

WORKING IN THE DARK.

By J. W. I.

THE result of observation during a varied experience as machinist, leads me to say that in threading a left hand nut in the lathe, the operator never fails to adopt the method by which starting to cut the thread is performed from the inner or face plate end of the job. This I call working in the dark, as there is a much simpler and easier way of doing it.

If you have no reversing belt on the lathe, cross the cone belt, use a right hand instead of a left hand threading tool, then run your lathe backwards and start your cut from the front. By doing this, you can see how the tool is working and make calipering easy. This little kink may be helpful to journeyman and apprentice alike.

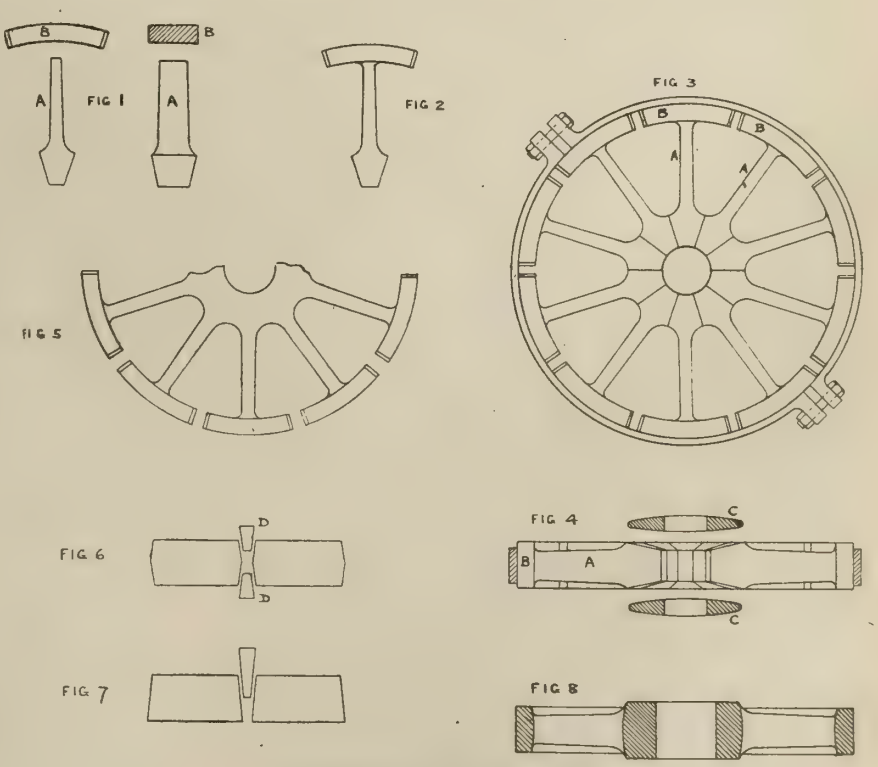
HIGH SPEED STEEL.

By J. H. W.

Before blindly deciding for high-speed steel, because fashionable, it is advisable in a small shop, that the superintendent go carefully into the question for himself, and see if he can really save money by adopting it. If his shop is equipped with modern machinery, he need have no hesitation in using it wherever possible. There are many shops, however, turning out good work to-day by means of machine tools which are distinctly old-fashioned. These old style machines were never built for heavy cuts, the cone pulleys and belting being too narrow to transmit the additional power required. In fact, all parts of the machine are generally found to be too light, to stand up to the strain imposed by modern high speed steel operation. Even were the line shafts speeded up and heavier belts put in, it will be found impossible to take heavier cuts than with carbon steel, owing to the excessive vibration of the machine.

All things considered then, it is highly improbable that more than 50 per cent. efficiency will be got out of high speed steel under these conditions, although it may be advantageously used for light rapid finishing cuts. The cost of reputable brands of high speed steel is from 2½ to 4 times that of ordinary crucible tool steel, therefore its purchase is not to be lightly undertaken unless it can be used at maximum efficiency. I do not wish for a moment to disparage its use in a shop fitted with modern machine tools, for under such conditions it has been shown over and over again to be well worth its extra cost.

Modern theory points to the advisability of the old-fashioned shop scrapping its machinery as rapidly as possible, and installing thoroughly up-to-date machine tools. This course generally pays better than attempting to stiffen and speed up tools that were never designed for the work now demanded of them.



An Interesting Piece of Forging Work.

Annual Outing of the Central Railway Club

By J. H. Williams

Being a brief account of how busy men spent a profitable and healthful day, forgetting for the time being, and wisely so, the stress and pressure of their week day callings. Such outings are a fitting climax to the work of the club during the winter, and do much towards arousing enthusiasm for future sessions.

THE fourth annual outing of the Central Railway and Engineering Club of Canada, took place on Saturday, June 17th About 250 members left Toronto at 9 a.m. by special train for Beaverton Beach, on Lake Simcoe. During the journey out and return, the energetic members of the committee, arranged as chefs in spotless white, dispensed various forms of refreshment, as well as some excellent smokes,—in fact the quality of the stogies was the subject of much favorable comment, and "Canadian Machinery" enjoyed them as much as any.

Doings at Beaverton.

Blea's Band was in attendance, and under the conductorship of genial Bandmaster H. G. Fletcher, headed the procession from Beaverton station to the hotel, where the camera man promptly went through his usual stunt.

The first event on the programme of sports was shortly afterwards brought off. This was described as a grand scramble to the dining hall; and strange to say, every member present entered. When the demands of the inner man had been amply satisfied a general move was made to the sports field, where the band was discovered parading in fantastic costume,—a very tall Highlander in a very short kilt being the most conspicuous figure; although all were a success.

Event No. 2, was soon called in the stentorian and megaphonic tones of Announcer E. A. Wilkinson. This was a grand five-innings baseball match between the Mechanics and the Pedlars, for a silver challenge cup. The game, which ended in a win for the Mechanics (6—5), created great excitement, and the frequent advice tendered to "Mike," showed that A W Carmichael was occupying a large share of the fans attention.

The third event.—Avoirdupois Championship, was very keenly contested. None were eligible unless measuring at least 40 5-64 inches around the "lower chest"—no blowing out during measurement permitted. One yard handicap allowed for every inch over the minimum permissible size. The distance was 100 yards and the race was won in great style by James Wright, with A. W. Carmichael a good second. The official time was a world's record?

The fourth event provided lots of fun. This was a three-legged race or triple expansion championship,—distance 100 yards. The wise ones traveled with a half open throttle; but one couple started off under a full head of steam, making great speed until nearing the mark, when their connecting rod buckled and wrecked the whole engine. The winners were T. Jeffries and R. S. Mabee. Time 14 secs.

Fifth Event,—The Tobacco Trust Competition, 100 yards.

Each competitor was provided with a clay pipe, tobacco and five matches. On the pistol shot he had to fill his pipe and light it before crossing the seven-yard mark and have it going at the finish. Bad firing caused the downfall of many of the contestants, and the race was won easily by G. Adams, the second and third being Geo. Cook and W. G. Adams. The two latter arrived at the tape the first time with their pipes out and had to return to the seven-yard mark to light up again.

Sixth event.—The Patriarchs' Rejuvenation. A "wait" for age event. 100 yards dash.

This was a handicap for men of 55 years or over,—one yard handicap for each year over age. The committee announced that in case of any dispute as to age, a qualified veterinary surgeon was on hand to settle the matter by an examination of the teeth. Amid the plaudits of his supporters, J. Kelly came in first, with S. Best, second best.

Seventh event.—Standing Broad Jump won by F. Scott, with a jump of 8 feet 9½ inches; J. Sharpe being second with 8 feet 6½ inches.

Eight event.—Relay race, once around the field. 1st, T. Cairns; 2nd, Purvis.

Ninth event.—100 yards dash open to all. This race caused lots of excitement, and was won by B. A. Dillon with W. G. Reid second and R. Polson third.

Tenth event.—Open walking match, once around the field. 1st, J. Lawless; 2nd, J. Smith.

This was a good race, inches only separating the men at the finish.

The sports wound up with a grand tug of war, Mechanics versus Pedlars; best of three pulls. The tension was terrific, both on the rope and amongst the spectators; the Mechanics finally being awarded the victory after a prolonged struggle.

President Baldwin, Vice-Presidents Bannon and Taylor, and the other members of the executive, worked hard all day, and it was largely due to their efforts, that everything passed off so successfully.

Presentation of Prizes.

At the end of the afternoon, handsome prizes were handed to the lucky winners by President Baldwin. They consisted of cut glass decanters, brass jardineres, safety razors, hammered brass trays, fountain pens, calabash and briar pipes, cigars, etc., etc.

The members of the winning baseball team each received a handsome umbrella, and the manager was entrusted with the care of the silver challenge cup for the next twelve months; it having to be won three years in succession before coming the property of the winning team.

Several members of the club spent the afternoon on the lake fishing, and returned with the usual yarns of the big ones they lost.

After a substantial supper at the hotel the band headed the return trek to the train, where the two-hour run back to Toronto was passed away in song and mirth; bringing to a close a thoroughly successful and enjoyable day.

MONTREAL TECHNICAL SCHOOL.

One of our representatives had the good fortune recently to be present at the trial of the large blast-furnace which has been installed in the foundry of the new Technical School, Montreal. At the conclusion of the trial, Mr. Macheras, the energetic principal of the school, made a tablet casting bearing the following inscription :—"January 7, 1911.—This tablet is the first piece of iron cast in the Montreal Technical School. G. DeSerres, President, H. J. White, Secretary-Treasurer, A. Macheras, Principal."

The foundry apparatus was made and installed by F. Hyde & Co., Montreal.

The interesting ceremony began at half-past two o'clock, at which time the furnace was lighted and put in operation. Less than an hour afterwards, the mould was opened, and after cooling, the tablet was completed and placed before those present for inspection.

The blast furnace is operated by compressed air and is of latest design. The first cast was highly creditable to the fitm of F. Hyde & Co., and particularly to their representative, Mr. Cote, who assisted throughout the trial.

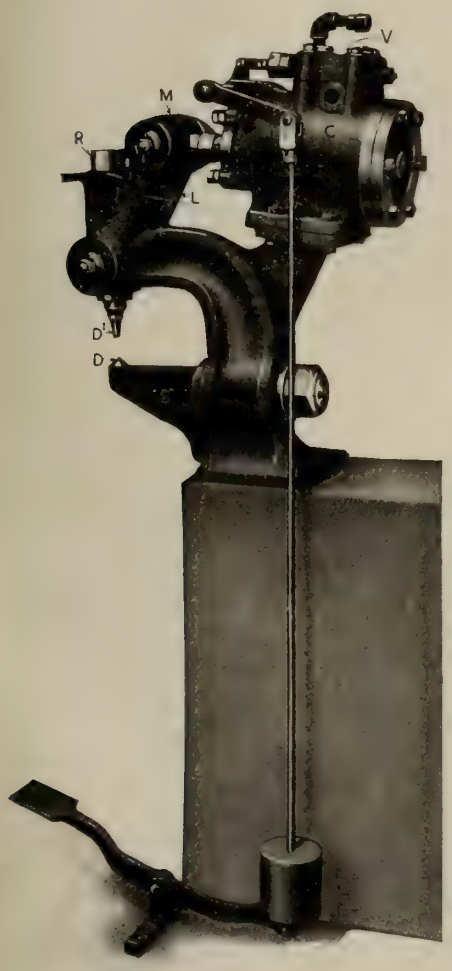
DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

ALLEN ADJUSTABLE STAKE RIVETER.

THE engraving shows a riveter of unique design and construction, recently built by the John F. Allen Co.,370 Gerard Ave., New York City, for sheet metal work. It is one of the smallest riveting machines built by them, having 7½ inch reach, variable gap and 5½ inch cylinder.

While embodying all those features which have contributed so largely to the



Allen Adjustable Stake Riveter.

success of Allen riveters as a type, it possesses, in addition, many original features of especial value for the work intended. It is designed for sheet metal work where the rivets used run from 1-16 to ¼ inch diameter, and are driven cold. The stake "S" is easily removable in order to permit of other stakes, suitable to the work in hand being used. This materially increases the range of work that can be handled, and will be found a great convenience, as stakes can be made of any shape or size at comparatively small cost to suit the most unusual and difficult jobs.

The machine can be operated by foot pedal, as shown in the illustration, or by hand lever, as desired. The work to be riveted is placed with the head of the rivet resting on the holding-on die "D," so as to bring the end of the rivet in line with the upper die "D-1," which usually stands about ½ inch above the top of the rivet. By pressing the foot on the treadle, air of from 60 to 100 pound pressure is admitted to cylinder "C." This causes the piston to move forward, and the side links "L" and middle links "M" to assume a position parallel to the axis of ram "R." The ram carrying the upper adjusting die "D-1" is thereby forced down upon the end of the rivet, forming a head with one stroke. By relieving the foot pressure on the treadle, the slide valve in valve chest "V" reverses the motion of the piston, and this returns ram "R" to its original position ready for the next rivet.

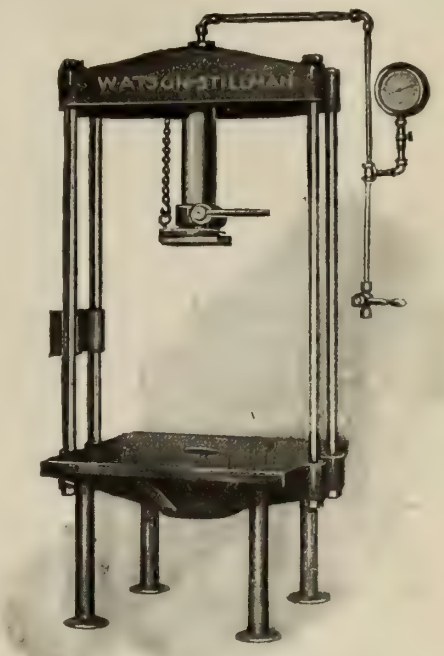
The number of rivets that can be driven within a given time is entirely dependent upon the operator, as the time consumed by the machine in driving the rivet is practically negligible. The amount of air consumed per rivet does not exceed 1-5 of a cubic foot. The machine is noiseless in its operation, and can be placed in any convenient location in the shop without interfering with other equipment. If preferred it can be operated by steam.

HANDY HYDRAULIC PRESS.

THE small hydraulic press, which we illustrate, was designed by the Watson-Stillman Co, of New York, for laboratory work and for crushing specimens of building material, but has proven most useful in machine shops, where small parts are press fitted, and where high pressure needs be brought to bear on small articles, for bending, straightening or flattening. It can be applied to endless odd jobs about any shop.

Convenient size premits this press to be mounted on a light truck and hauled from place to place, the operation being quick and easy Rapid movement of the ram is facilitated by the lever and connecting links shown at the left. The handle at the right, on the extension lever socket, will operate the pump easily where only light pressures are required, and by applying the extension lever there may be developed a pressure of 30 tons. The platen area is 8 in. square; the platens are 8 in. apart at maximum opening, and the ram movement is 4 in. The base is 12 in. by 16 in., and the height overall is 27 in. The main cylinder is a steel forging, machined to fit perfectly into the reservoir, and the pump cylinder is of bronze.

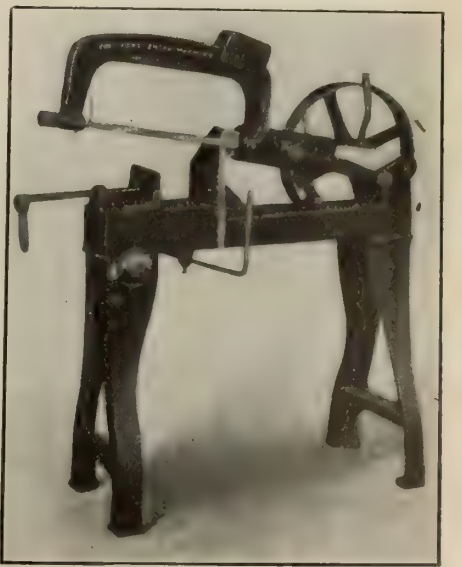
The press is designed to withstand severe service, and is ideal for small work requiring high pressures.



Handy Hydraulic Press.

A NEW TYPE OF POWER HACK SAW.

The hack saw illustrated and built by the Ford, Smith Co., will cut all classes of material up to 5 inches sectional area.



Ford Smith Hack Saw.

The saw frame and guide are cast in one piece, and have a long bearing on the guide bar. This guide bar is a special feature of the machine, being of rectangular section, instead of the round guide found on a number of machines. One end of the guide bar swings on the same centre as the driving shaft; the other end being guided on an extension of the back jaw of the vise, ensuring a true, square cut. The gong is another useful feature, ringing loudly when the piece is cut off, and ensuring attention on the part of the attendant.

The machine weight is 160 pounds, well distributed. This, together with the long connecting rod and rectangular form of guide bar, enables it to be run to its full capacity without vibration, a feature adding materially to the life of the saws.

PIPE-BENDING MACHINE.

The text and illustrations, figs. 1 and 2, are descriptive of an efficient type of machine for bending pipes and tubes, and is suitable and convenient for steamfitters and others handling these wares. It has all the advantages of the more expensive machines made for a like purpose, and in its largest size, is compact and light enough to be carried in a workman's bag. The machine consists of a number of grooves whereby varying sizes of tube can be instantly bent without change of parts being necessary, and one bend may follow another in any direction quite closely to the last one. Simplicity of construction is another recommendation, as any strong youth can understand and operate it. Two inch piping can be bent with ease to a variety of angle, and will lose hardly any of its contour in the process. The complete range manufactured, will deal with any size pipe from $\frac{1}{8}$ to 4 inches O.D. The smallest has a capacity of $\frac{3}{4}$ inch and weighs only 24 lbs., while the largest has a capacity of from 1 to 4 inches. Sizes 1 and 4 constitute a complete installation for dealing with every grade between $\frac{1}{8}$ and 4 inches, and the three smallest sizes, the largest of which bends up to 2 inches, may be fixed to a strong bench or table, or carried on a pipe vise. The "FORTUNA," being the trade name by which the machine is known, is made by the Fortuna Machine Co., Leicester, England; the Canadian Agents being Francis Hankin and Co., Montreal.

HEAVY WET TOOL GRINDER.

The Ford-Smith Machine Co., Hamilton, Ont., have recently put on the market a new type of heavy wet tool-grinder which has some novel features. In a machine shop, large outputs and accurate work depend to a great extent upon the tools being correctly ground. With a powerful, well-balanced wheel of the proper grain and grade and running at the right speed, with an easily regulated water supply, the operator can keep the tools in the best shape, with a minimum of time and trouble.

Fig. 1 shows the general appearance of the machine. The body cast in one piece, is exceptionaly stiff, sits solidly on the floor, and forms a tank which extends to within about fifteen inches of the bottom. The door shown in front gives access for cleaning out the tank after it has been emptied by means of the drain cock.

One of the most important features of a grinder is the spindle, and in this machine it is of liberal proportions and runs in long bearings lubricated by self-oiling rings.

To allow the wheel to be run at an approximately constant peripheral speed as it wears down, a two step cone pulley is provided. This may be replaced by a fast and loose pulley if desired, (the necessary belt shifting gear being attached to the machine) which can then be driven direct from a main line shaft.

The system of water supply is novel. It can be easily regulated by the hand wheel in front to give any desired delivery from a light flow to a heavy flood, pumps and pipings being entirely dispensed with. The wheel runs in a hinged segmental trough, which can be raised or lowered by the rod and hand-wheel at right hand side of the machine, thus regulating to a nicety, the amount the wheel dips into the water. The overflow and splash run back into the main body tank, from which it may be drawn off and returned to the trough at intervals, such as when putting in a new wheel. The hood is brought well forward of the centre line, and has side flanges to prevent water being splashed backward. A swivel cap is also provided to ensure water being delivered on the tool as the wheel wears.

The tool rest is designed so that all the usual tools may be easily manipulated, and is shaped at the back to allow a deep clearance to be ground on long tools, a feature which is not always given sufficient attention by designers. Another special feature of the machine is the removable tray. For or-



Fig. 1—Fortuna Pipe Bending Machine.

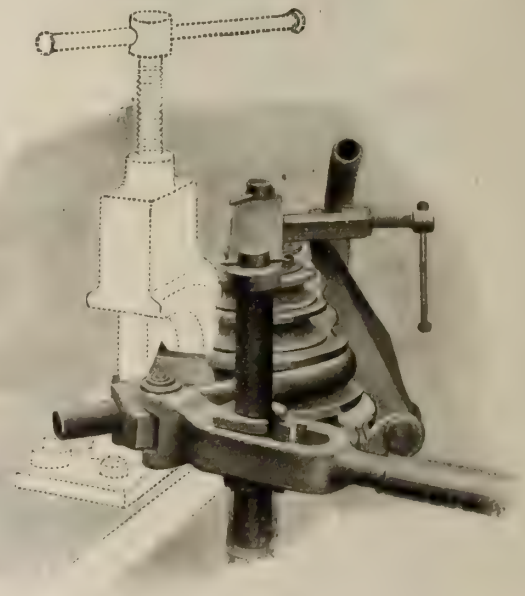


Fig. 2.—Fortuna Pipe Bend ng Machine.

dinary shop-tool-grinding, the tray remains on, as shown in the cuts, in which position all splashing is confined inside the pan, thereby keeping the operator dry. For extra long tools, however, the high edge of the tray would not allow of the necessary clearance being ground, so it is simply lifted off, being replaced when the tool is finished.



Fig. 1.—Heavy Wet Tool Grinder.

The machine presents a neat appearance, is substantially and heavily built, and furnished with a countershaft having self-oiling bearings and double sided hangers. Fig. 2 shows the wheel trueing device.

A NEW ENGINE LATHE.

A new design of high duty engine lathe has been brought out by the American Tool Works Co., Cincinnati, Ohio. It is made in two sizes, 36 and 30 inch, and embodies several interesting features. Abundance of power is secured; more than sufficient to allow the use of the most improved high speed steels available. The general design of the lathe is correspondingly massive, ensuring rigidity and absence of chatter.

The lathe is made with five different types of headstock, as will be presently described. Fig. 1 shows the 36-inch lathe equipped with the patented geared head and motor drive. A constant speed motor, either A.C. or D.C., is located on the top of this geared head and connected to the main driving shaft by three gears. The motor is under constant control by means of the controller hand-wheel, conveniently located at the right hand end of the carriage.

The patented geared head gives twelve spindle speeds, ranging from 6 to 257 r.pm. The head is of the compound back-geared type and is of massive and rigid construction. Only 14 gears are used to give the 12 spindle speeds and the changes are made by hand wheels and levers on the head front. The gears are designed to allow of comparatively high motor speed—1,000 to 1,200 r.p.m.—thus keeping down the size and first cost of motor. A sensitive friction clutch is provided on the driving gear for starting, stopping or slightly moving the gears in the head, in order to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The spindle is of high-carbon, hammered steel, and has a 2 9-16-inch hole throughout its length, the spindle bearings being of phosphor bronze and fitted with sight-feed oilers.

An entirely new feature of these lathes is the quick change gear mechanism, which has been developed to a high pitch of excellence. All steel gears are used, and the mechanism provides a range of changes for feed or screw cutting which is practically unlimited. The index plate is situated on the feed box directly over the sliding tumbler, and clearly shows how to obtain each thread and feed. The feed box consists of a gear box on the front of the bed, with two levers and a steel sliding tumbler, the latter working in conjunction with a cone of eight steel gears. The cone of

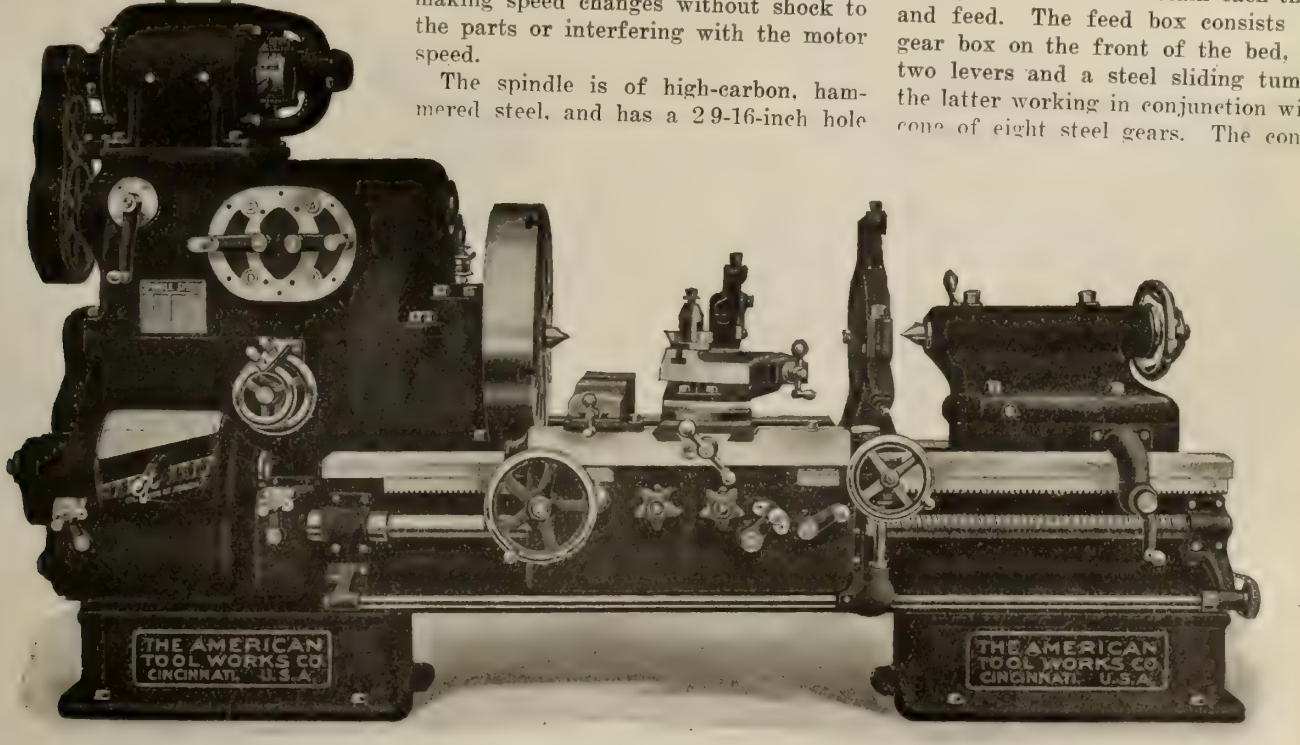


Fig. 1



Fig. 2.—Heavy Wet Tool Grinder with Trueing Device.

gears and also the tumbler gear are cut by Brown & Sharpe 20-degree involute cutters, which produce a tooth pointed at the top and exceptionally wide at the base. This form of tooth is unusually strong and permits of instant engagement while running, without the tumbler gear riding on top of the cone gear before dropping into place.

The carriage is of heavy construction, especially in the bridge. It has a full continuous bearing of 44 inches on the V bed. As may be seen from the cut, the apron extends the full length of the carriage, and is double, so that all shafts passing through it have a double bearing. Both longitudinal and cross feeds are reversed through a lever from the front of the apron, and not at the headstock, as on most lathes. This is a great convenience on long tools, where the operator is some distance from the headstock. All gears and pinions in the apron are steel, cut from the solid, and can be conveniently lubricated from the front.

The rack pinion can be disengaged from the rack when screw-cutting is in progress, and means are provided to make it impossible to simultaneously engage the feeding and screw-cutting mechanism.

As before mentioned, the lathes are built with five types of headstock. Fig. 2 shows the patent geared head arranged for belt drive; the head is identical with that shown in Fig. 1. A flat surface is provided on the top of the gear box so that it is an easy matter to change over to motor drive at any time after the installation of the lathe, if desired. All that is required is to instal a motor on the flat surface provided and connect the armature and main driving shaft by three gears. It is a simple matter to substitute a gear for the pulley on the driving shaft.

Figs. 3, 4 and 5 show other forms of belt-driven headstocks. Fig. 3 is a powerful triple-geared head, having a 4-step cone pulley, giving twelve spindle speeds. The steps of the cone pulley are of large diameter and take a 5¼-inch belt; a large area of belt contact being provided. The gear ratios are extra high, so that ample power is ensured for any work within the capacity of the machine.

Fig. 4 shows a double back-geared headstock. This gives nine spindle speeds, 3 direct, 3 reduced, and 3 double-reduced.

Fig. 5 shows a head designed for medium class work. This is a single back-geared head with a 4-step cone pulley, giving eight spindle speeds.

The lathes have a standard length of bed of 10 feet, but any length will be made to order, advancing by 2-feet lengths.

The 10-foot bed takes 4 feet 3 inches between centres when the patented geared head is fitted, and 3 feet 9 inches when a cone head is used.

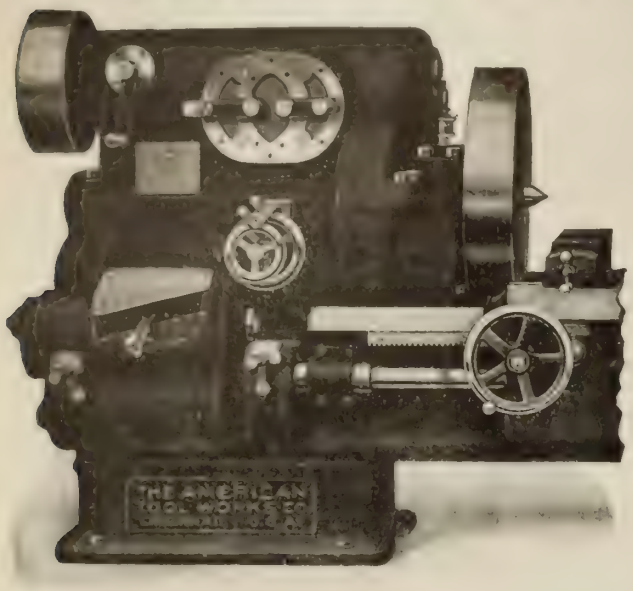


Fig. 2.

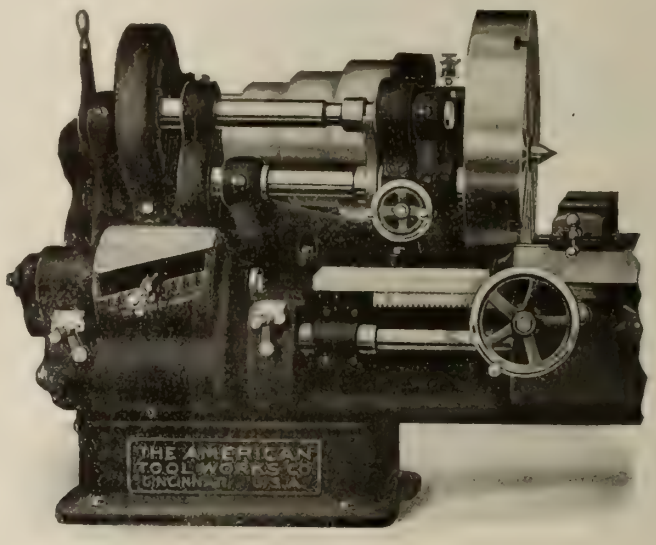


Fig. 3.

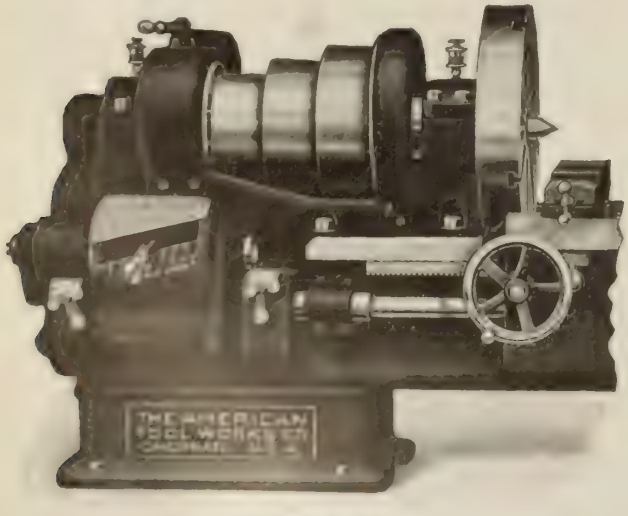


Fig. 4.

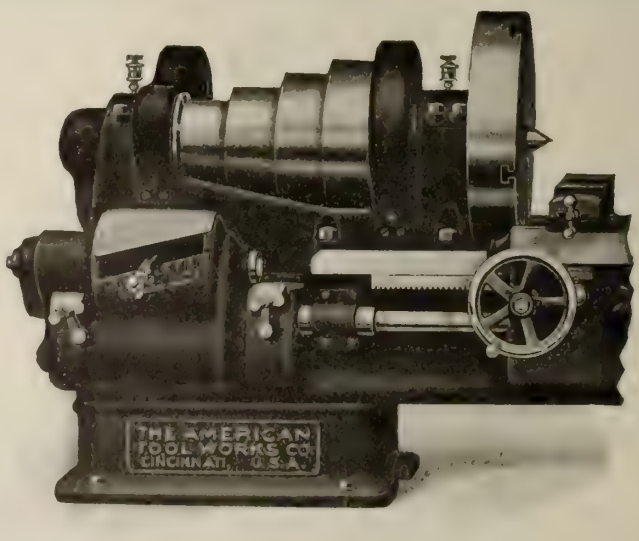


Fig. 5.

Co-operation Between Central Station and Manufacturer *

By Chas. F. Scott **

Showing That an Exchange of Views and Opinions Results Beneficially to Both Parties, and in Addition Affects Favorably the Community as Ultimate Consumer. The Writer is a Representative of a Large and Well-Known Electrical Equipment Manufacturing Concern, and His Ideas Formulated in this Paper, Voice the Expressed Desire We Believe of Reputable Makers of Machinery, Electrical and Otherwise, While the Subject Chosen Deals More Directly With the Relationship That Should Exist Between the Manufacturer and Operator in One Section of the Whole Wide Field of Engineering, We are Certain That Similar Co-operation in Other Spheres Would Tend Likewise to Improved Quality of Results and Decreased Trouble in Attaining Them.

CO-OPERATION between the central station and the manufacturer of apparatus will be treated for convenience under three heads ; first, "Engineering," which will deal with the apparatus by which the central station produces and distributes its current ; second, "Commercial Engineering," which will treat of the apparatus (such as motors, lamps, heating appliances), and the methods for extending the use of central station service ; third, "Commercial," which will deal in a more general way with the common commercial interests and prosperity of the central station and the manufacturer.

I.—Engineering.

Good apparatus well operated is the engineering basis upon which the whole central station business rests. It is useless to expect good service from badly designed or badly built apparatus in which central station operators have no confidence. How can the central station co-operate with the manufacturer to secure better apparatus ?

Standard apparatus should be purchased if it will meet the requirements. Modern manufacturing is based on the principle of duplication, of making things in quantity. Designs are carefully prepared and are modified as experience directs, so that much of the standard apparatus of to-day is the outcome of years of evolution in which the best thought of the designer, the best skill of the factory and the results of experience are combined. Patterns, dies, tools and the experience of the workmen all are available for the making of a standard product in less time and at less cost than a special or new one which has not had the test of service. Hence, whatever the individual central station or central stations together, can do toward the standardization of voltages, frequency, and the acceptance of standard types and sizes of generators and auxiliary apparatus, will not only assist the manufacturer, but will in the long run, bring to the central station better and cheaper equipment.

Conference with the manufacturer before deciding upon a definite type or size of generating unit or other apparatus may be helpful in determining what standard apparatus is available to most nearly meet the requirements. Substantially the same or sometimes even better results, can be secured by such a conference, as are attainable with special apparatus, in addition to a gain in first cost, in time of delivery, and in securing machines which are of standard type. The central station is thus assured of getting the apparatus most suitable for its service, by securing the advice of the engineering department of the manufacturer which is necessarily in touch with the new and changing conditions, and with the operating requirements of other stations. The wisdom of such a conference is obvious, yet it is not uncommon for rigid specifications to be presented without conference and without provision for alternative propositions.

Electric Practice Development.

On the other hand electric practice is continually developing. We must continually improve and progress. New conditions arise. To improve his apparatus, the designer should know just what it must do. He may surmise the conditions, and he may make laboratory tests, but these may not be the actual requirements and conditions of service. He needs the experience which the central station operator possesses. Lightning arresters for example, designed according to theoretical principles and tested in a laboratory were liable to some startling surprises when installed on operating circuits. The development of the present arresters has come about largely through the visits of the designing engineers to the power houses and circuits of the operating companies, and through the assistance rendered by the operating engineers. Likewise regulators, switches, circuit breakers and instruments are the outcome both of the laboratory and experience in actual service. Now the experience of the central station operator can greatly assist the manufacturer. To be effective, there must be freedom and frankness—not mystery and secrecy. If something is not satisfactory, if there is some weak point in the apparatus, if there is some new condition which is not met, little is gained by saying that the whole thing is a failure, while much may be gained by definite, intelligent information.

Conditions are rapidly changing in central station designs, and substantial engineering progress requires that the skill of the manufacturer and the experience of the operator be combined. Perfect apparatus we can hardly hope for, but we shall come more nearly to attaining it, as the engineers of central stations and of manufacturers, recognizing that they have common problems, set about to solve them in a businesslike way to which each contributes his part.

II.—Commercial Engineering.

The growth of the off-peak load and of the power business is the most striking feature in central station activity at the present time. Motors are replacing engines in industrial plants ; they are finding new fields in domestic and commercial use to an extent not thought possible a few years ago.

This development is the outcome of a new type of engineering study and commercial activity. The application of electric power is first of all an engineering problem. A motor must be adapted in speed and power, and in mechanical connection, to the work which it is to do ; but beyond these simple problems, is the general problem of using to best advantage the power which the motor develops. It is the superior service which the motor gives, the convenience with which it can be operated, the better speed adjustment, the increased quantity or the improved quality of the output of the machine it drives, the simplicity of motor drive as compared with engines and shafting and belts, and the independence of one tool or one department from others when driven by separate motors —these and a score of other factors are the indirect advantages which often become the really important things to be gained in using electric power.

*Paper read at the 25th Annual Convention of the Canadian Electrical Association, Niagara Falls, Ont., June, 1911.

**The Westinghouse Electric and Manufacturing Co.

Hence it is the specific, the particular, and the definite adaptation of electrical appliances which bring results. The knowledge of how to accomplish these results comes through careful investigation and experience. This is often beyond the scope of the individual central station company, but it is something which must be undertaken by the manufacturing company, as it must know what are the exact conditions in order that it may design its apparatus so as to meet them effectively. For example, if a motor is to operate a certain tool, the designer must know the maximum power, the average power and the need for speed adjustment and variation. He must know these things in their relation to each particular machine or industry. He naturally acquires an intimate knowledge with the power requirements and the power consumption in actual practice in many places. He also determines the advantages and disadvantages which result in actual experience under many different conditions. It is just this kind of knowledge and experience which is essential to an intelligent and successful building up of the motor business.

Education of the Consumer.

The prospective user of electric power is often unfamiliar with the apparatus and the various engineering features involved in its application and operation, and he is ignorant or unconvinced of the advantages which will result from its commercial introduction. Hence it is, that the large power loads of progressive central stations have been the result of a systematic educational campaign among prospective customers. This is a field in which manufacturing company and central station can work together. The information and data which the progressive manufacturing company necessarily acquires in order to design its apparatus to meet the requirements of actual service are the precise data which the central station needs in order to understand and effectively present the situation to the power users who should serve.

Electricity applied either through motors, lamps or heating devices is usually an auxiliary factor. The cost of electric power is a small part of the total cost, and yet it may contribute very largely to successful operation. For example, the cost of power in most industries is only three or four per cent of the total cost of the product, and the cost of lighting is less than one per cent. Hence it follows obviously that if greater or better service can be obtained from both or motors by an increase or an improvement of the power or light, then considerably greater expense for light or power is amply justified. This may be illustrated by an example. Assume as a convenient basis that the cost to the purchaser for a 5 h.p. motor is $100.00. Assume further that the annual charge for depreciation, interest and repairs is $20.00 per year, or say $.07 per day. In the daily cost of production, therefore the first cost of the motor appears as 0.07. The power taken by the average 5 h.p. motor is say 2 k.w. (corresponding to a load factor of 40 per cent.); hence, the power for the 10-hour day will be 20 k.w.-hours and, if the rate is say, $.025 per k.w.-hour, the cost will be $.50 per day.

If the motor drives a line shaft supplying power to five workmen at $2.00 per day, their wages will amount to $10.00 per day. The various overhead charges in the operation of machine tools is about one and one-half times the operators' pay. (See "Notes on the Cost of Operating Machine Tools," A. G. Popcke, Electric Journal, December, 1909). This gives the overhead charge as one and one-half times the wages, or $15.00 per day.

The various items assumed in the total cost of production, with this 5 h.p. motor, in the present typical case, are as follows:—

Cost of motor per day	$ .07
Cost of power per day	.50
Cost of wages per day	10.00
Cost of overhead per day	15.00
Total cost per day	25.57
Total cost per hour	2.56
Total cost for twelve minutes	.50
Total cost for one minute	.04

Analysis.

The cost of power is $0.50 in a total of $25.57 per day, or only 2 per cent. of the total. Suppose that it be possible by using more power to slightly increase the output, note what will result. If the power used were increased one-tenth, making $0.55 instead of $0.50 per day, and this increases the output by say 5 per cent., then the production will be increased in value by 5 per cent. of $25.57, or a little more than $1.25. Hence, $0.05 more spent for power would result in a net gain of $1.20 under these conditions, or twenty-four times the cost of the additional power. These figures may be put in the following form:

Assumed gain in production	$1.25
Assumed additional cost of power	.05
Net gain	$1.20

Expressed in another way, the cost of power per day is $0.50, which is equal to the total cost for 12 minutes; i.e., one can afford to pay twice as much for power if he could thereby gain more than 12 minutes per day. Hence, the problem is not to save power, but to use power effectively. The cost of power is so small an item in the present example that it can be even doubled if a gain in rate of production of more than 2 per cent can be secured thereby.

The cost of the motor is equivalent to $0.07 per day, or approximately one-quarter of one per cent. of the total cost. Obviously, if some other motor equipment would give even 1 per cent. greater output, the value of which would be $0.25 per day, it would be economical to install it, even though costing twice as much.

Expressed in still another way, the cost of the motor per day ($0.07) is less than the total cost for two minutes ($0.08). Hence, if one motor equipment will save more than two minutes per day over another one, its purchase is justifiable even if the price were twice as great. If therefore, one motor outfit be more conveniently operated, if starting or stopping requires less time, if there is less interruption due to poor insulation or hot bearings or controller contacts, which amounts on the average, to even one or two minutes a day, or to one hour a month, then it is well worth while to purchase the better outfit even at a very considerably increased cost.

The same line of argument may be used in comparing group drive with individual drive. It is well known that the power consumption is in general, less with individual drive than it is with group drive, but that the first cost of several small motors is more than the first cost of one large one. If however, the cost of motors is a small part of the total cost (in the above example it represents less than 1 per cent. of the total cost of production), then it will be economical to use the individual drive, provided that even a few per cent. increase in output can be secured. Often the elimination of delays due to belt repair, shafting troubles and the like will alone much more than make up for a very considerable increase in the first cost of motor equipment.

In view of the foregoing analysis, it is poor economy to try to economize by reducing the amount of power used, provided more power can make even a slight increase in the output. Further, it is poor economy to try to economize in purchasing motor equipment, because any appreciable gain in production will much more than offset the increased cost of the best possible equipment. The figures in the foregoing example are assumed, but the actual figures applying to any practical case will usually lead to similar conclusions.

Lighting and Heating.

In the departments of lighting and heating, there is a similar situation. As the applications of electricity become more specialized, they are being handled in a scientific way. In incandescent lighting for example, the advent of the tungsten filament lamp is coincident with the rapid progress of the science of illuminating engineering. Formerly an incandescent lamp was placed wherever

there would ordinarily have been a gas jet. Now, correct lighting is laid out by illuminating engineers. The comparative newness of this work is illustrated by the appendix to the lecture on "Illumination Calculations," delivered in the series of lectures on Illuminating Engineering at the Johns Hopkins University last Fall. Following the lecture is a Bibliography of Illumination Computations in which there are references to 36 different books or articles. Two of these are without date, a few appeared in 1906, and all the rest have a later date. In other words, the literature on Illumination Calculation is just about as old as the tungsten lamp.

The manufacturers of lamps and of reflectors have made a scientific study and practical investigation as to the best ways of using their products, and are ready to aid the central station in specifying good illumination. This is bringing about a new era in electric lighting. Ten years ago, there was the small carbon incandescent lamp and the carbon arc lamp. These had existed with little change for twenty years, but within the past decade have come new lamps of various types, taking less than half the energy for the production of the same light, having a wide range in candlepower and leading to a scientific treatment giving practical results which were before unattainable. Simple as these things are, they are not understood by the general public, and the application of what is now available can come only through the progressive commercial presentation of the engineering principles which are now established.

The purpose of lighting offices and factories is to enable the workers to do their work. Good lighting promotes speed and accuracy by enabling things to be seen better. It places the workers in more agreeable and cheerful surroundings, and removes the cause of eyestrain and headache. Now, the total cost of lighting is trivial compared with wages, and the difference in cost between good light and bad light is often less than 1 per cent. of the cost of the wages. In other words, if an amount equal to 1 per cent. of the wages be used for improving the lighting, a gain of many times this amount can be secured in the quantity and quality of the work produced.

Likewise in heating appliances, the field is new, the conditions of application are varied, the fundamental facts and the resulting advantages are not understood by the general public, and there is again necessary an active commercial effort along sound engineering lines in order to develop this field. Here again the designing engineer and the manufacturer who has made a study of the conditions under which this apparatus can be applied, is ready to lend most valuable assistance to the central station in the extension of the work.

In cases where the first cost of a motor is small compared with the cost of the power that it consumes, and where the cost of heating or other current-consuming devices is small compared with the value of the current which they use, the central station has the opportunity of furnishing upon favorable terms or even free, the motors or heating apparatus with the expectation that the income from the current used will pay a handsome profit. With the 5 h.p. motor which has been cited as an example, the cost of the motor is 7c per day, whereas the value of the current it uses is $0.50 per day, or seven times as much. A flat-iron or luminous heater soon consumes current far beyond its original cost. Even the economical tungsten lamp of average life consumes current equal to many times its first cost. The first cost of carbon lamps is so low, compared with the current they consume, that the free renewal of lamps is a common practice. The ordinary person however, probably objects more to pay $0.20 or $0.25 for a lamp than he does to paying $3.00 or $4.00 for the current it may consume. Likewise, a man may hesitate to pay $100.00 for a motor although he may be perfectly satisfied to pay $200.00 per year for the current it uses. Hence, a study of the relations between first cost and power cost will often open the way by which the central station can cultivate the habit of using electricity by a generous policy in the furnishing of apparatus.

CANADIAN MACHINERY.

This mid-summer number of Canadian Machinery is brimful of live topics engaging the attention of the engineering profession in all its grades and varieties. Simplicity of treatment will be found to pervade the subjects dealt with. By becoming a subscriber you are assured of being kept up-to-date in your practice, as well as being assured of intimate touch with the sayings and doings of men in the forefront of mechanical progress.

We are all apt to take too narrow a view ; we fail to see that the really important thing is not the saving of a few cents in doing a thing by the old way, but in the large economies which come from new methods which electricity makes possible. Efficiency in operation and in management as well as in power plants and in machinery is now awakening interest and wide discussion. Electricity is the great modern means of securing efficiency in the applications and uses of power. The progressive men of manufacturing companies and of central stations are beginning to recognize this and through their efforts it is beginning to impress itself upon the public. The problem is a tremendous one, its solution means much for the public, for the central station, and for the manufacturer, and it merits united effort in its solution.

III.—Commercial.

In their commercial prosperity and success, as measured by the earning of dividends, the manufacturer and the central station have much in common. One supplies apparatus, the other operates it, and together they contribute to supply a growing need of the community. The central station is no longer a novelty supplying current within a radius of a mile or so to those who can afford the luxury of an incandescent lamp upon a combination fixture where the gas can be lighted when the current fails, for in recent years small companies are uniting into large systems. Hence, light is no longer a luxury, and the company is called a Public Service Corporation. It is recognized, both practically and legally, as an institution which supplies a fundamental need by rendering a public service to the community. Government commissions see that the public is provided with an adequate service at fair rates and also that the company is protected against unjust competition and that it secures rates which are fair and adequate.

Moral and legal obligation, as well as good business policy, dictate that the central station should supply the best possible service and should extend that service in the public interest as well as its own interest. This means that the central station must provide a reliable and continuous service ; that it must not merely be ready to supply current, but that it must also render a public service in showing how to use electricity and how and what direct and indirect gains follow from its use, and further, it must develop its equipment and its organization to meet the larger field of service which the universal use of central station power will make necessary.

Continuity of service has a new importance for not only lamps, but street cars, elevators, mills, factories, the conveniences and necessities of the store, the office and the home are dependent upon electric power. Fundamental to such service is good apparatus. Some of the ways in which the central station can co-operate with the manufacturer in designing and manufacturing such apparatus have already been considered. There is, however, another, the commercial standpoint.

Commercial Standpoint.

The central station in fairness to its patrons and for its own success requires the best possible apparatus. Differences in first cost are trivial. The loss of direct revenue from a short interruption to service (not considering loss of prestige and the cost of repairs) will much more than compensate for the difference between the cost of inferior apparatus and the cost of the best. Not only should the best apparatus be bought, but it should command a fair price. The manufacturer who makes the best should be supported and he should be encouraged to make his apparatus still better.

In the applications of power which have been considered under "Commercial Engineering," it is to the common interest of the user, the central station and the manufacturer that the results should be successful. This means that adequate apparatus must be properly applied. From the standpoint of the customer, reliability and continuity of service are of first consequence. These depend, first of all, upon the quality of the electrical apparatus which is used. As the first cost of this apparatus is insignificant compared with the cost of the power it uses and the value of the products which it aids to produce, quality and not price is of first importance in the installation of a motor. Whatever the central station can do to aid its customers in securing good motors, whatever it can do to support the manufacturer who makes good motors and to induce the making of still better motors, contributes to the best interests of all concerned. The central station and the manufacturer together, by educating the public to the use of electricity in the right way on a sound engineering basis with the best apparatus are laying the surest foundation for their commercial success.

Progress Outlook.

Looking to the future, there is a wonderful outlook for the central station if we may estimate the future by the past. Twenty years ago, arc lights, incandescent lamps and street railways were operated from three different types of generators, few of which exceeded a few hundred k.w. in capacity. Ten years ago the steam turbine was being talked about and power load from central stations was beginning to be seriously considered.

To-day, the polyphase alternating current generator supplies electric service of every kind and it is demonstrated that the large central station plant is the cheapest to install, the cheapest to operate and the most reliable in the service which it gives. The uses of power are extending, isolated plants are disappearing, the domestic uses of electricity for light and heat and power are increasing, innumerable appliances for using electricity are constantly appearing, the railway terminals of the great steam roads and the electrical operation of suburban and trunk line service are matters of the immediate future. The central station should be the source of power for all purposes.

Future Policy.

To insure that the electrical progress of the next decade will keep pace with that in the past, the central station must meet the new demands for reliability, and for a broad comprehensive expansion of its activity and its policy. Apparatus larger in output and better in quality will be demanded for generating, controlling and using electric power in all forms. The experimental investigation and the practical development of apparatus has been carried on in the past largely by the manufacturing companies. They have expended millions of



Bronze Casting, 5 ft. Diameter, 12 ft. Long.

dollars in developing new and better apparatus and the central station has reaped the direct benefit. Such work must go on; it must be aided both by engineering co-operation and by the commercial endorsement of the central station interests.

Modern civilization has been brought about by the steam engine, through its effect on transportation and manufacture. Electricity is bringing about a new power era, because it facilitates the generation, the transmission, the distribution and the universal application of power. The central station is the agency for supplying this power. Upon its progressive policy in acting with the manufacturer of apparatus on the one hand, and the public on the other, depends the commercial prosperity of manufacturer and of central station, and the general welfare of the community, whose industries and transportation and daily life are becoming more and more dependent upon electric power.

A LARGE BRONZE CASTING.

The illustration shows an interesting and an exceptionally large bronze drum casting. The drum is 12 feet long, 5 feet in diameter, and is used as the drying surface in a large vacuum rotary drum drier.

The drums for this purpose are generally made of dense air-furnace iron, but in this case it was necessary to use a high quality bronze drum, a circumstance due to the fact that the vegetable extract to be dried on the drum would become discolored if it came in contact with iron.

The mold for this casting was swept up in dry sand, the core being swept up in loam. When the casting was poured, the mold was in a vertical position, thus accounting for the very clean surface free from blow-holes.

It required 16,000 pounds of metal to pour the casting and on account of this large quantity it was necessary to melt the metal in a 48-inch cupola.

The practice of melting bronze in a cupola is unusual, but the Buffalo Foundry and Machine Co., Buffalo, N.Y., the company which made the casting in question, has been very successful in following this practice where large quantities of metal are required.—Castings.

THE HAMILTON GEAR & MACHINE COMPANY.

The Hamilton Gear & Machine Co. have recently opened up a new factory on the corner of Concord and Van Horne Avenues, Toronto. The building, of modern concrete construction, is arranged to give the maximum natural lighting effects, and measures 50 by 55 feet. Ground adjoining has been secured for extension. Accurate cutting of spur and bevel gears is the firm's specialty, the equipment for handling same consisting of Gleason gear shapers, whose feature is theoretical accuracy.

So far as we know this is the only firm in Canada thus specializing, and from reports received of the work already on hand and in prospect, there is every reason to believe that a much-felt want is being taken care of.

A good way to fasten a wood handle onto a tool is to fill the hole full of shellac; then heat the shank of the tool almost red and press it home.—American Machinist.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. VII. July, 1911 No. 7

RELIABLE EQUIPMENT.

In another section of this issue will be found an article in which the writer makes a plea for "Co-operation between the central station and the manufacturer." It is not our intention to dwell on that particular topic, rather is to draw attention to certain definite suggestions made by Mr. Scott, and which are worthy the serious attention of manufacturers and all others who use electric power, electric light, or heat by electricity.

We are rather inclined to believe that the tendency to cheap equipment and saving of light is more predominant than otherwise, and the careful reading and study of what Mr. Scott makes so clear and convincing should tend to a more reasonable attitude being adopted on the part of all concerned. First cost, although needs be high, is not by any means the prime factor in the power and lighting instalation of any manufacturing concern, but rather is it, as aptly put in the paper, "a problem not to save power, but to use power effectively." We believe the advice and information given, to be appropriate and well timed, and look for highly beneficial results in the matter of their adoption and practice.

THE EFFICIENCY QUESTION.

In common with other technical and trade journals, we are giving our readers opportunity to become familiar with the ideas and publicly-expressed views of men who have devoted much time and study to this presently all-absorbing topic.

One feature prominent in the various phases of the subject is the easily appreciable grasp that men of moderate intelligence can take, digest and give reasonably correct and reliable opinions as to the worth or otherwise of any particular scheme.

Carefully-drawn observation is the basis from which individual ideas for betterment have originated, therefore, mathematical calculation and intricate formulae are for once, conspicuous by their absence, in spite of the word "scientific" bearing a qualifying relation. The various views expressed make interesting reading, are educative, yea helpful, because the reader feels that strings are being tuned with which his own are to a large extent in harmony.

The tendency of this efficiency movement is undoubtedly for all-round betterment, and while, like every other reform or revolution, for such it is, large progress may tarry, we may rest assured that it is gathering momentum all the while, and that out of the multiplicity of schemes and ideals propounded, new and improved conditions will arise.

A QUESTION OF FINANCE.

Much keen competition is apparent in every department of our business life to-day, and, digressing, we may say that it exists to an equal extent in social and church circles. Money, the purchaser of comfort, luxury, position and honor, is king, and rules with a hand of iron. This money determines the price to be paid for some cherished idol, from the hoard we possess, and when we have no hoard or are living from hand to mouth, the degree of misery we must endure.

It is our purpose to draw attention to this latter aspect, as it affects what we might term the small manufacturer, in his capacity as "feeder" to the large corporation.

This is a day of mergers and mammoth enterprises, having large administrative staffs; a day in which the "little fellow" is either swallowed up or forced to the wall. These two latter contingencies seem to us somewhat unfortunate, not only because it cuts the feet from personal effort, but because of the tendency towards complete extermination of a business necessity.

Big manufacturers don't realize sufficiently, nor appreciate as they should, the service these small concerns render them, especially during periods of great activity, when to avoid starting a number of extra men temporarily to cope with the rush, it is a convenience to send part of the work out, and have it executed by the "feeder." Just here is where the crowding-out takes effect, and the instrument used is delayed payment for work done. No thought is given to what is common knowledge, that these small business men have their cash almost wholly tied up in plant, that their employes' wages and trade accounts have to be met regularly (the latter more so perhaps than in the case of the big corporation) and that the banks are more chary, and look with a large measure of suspicion on overdraft requests; yes, in spite of the fact that hard work and honesty are distinctly visible.

We appreciate the labors of bookkeeping, and a like system of payment for all, if possible, nevertheless it is a hardship unspeakable for 95 per cent. of these "feeder" shops (patternmaking, molding, machine, etc.) to have to lay out of their payments, not only 90 days, as some require, but even 10 days. Give your "feeder" a chance, put betterment of this department of paying him one of your pressing propositions to be solved, and as a large corporation you will be helping to ensure a continuance of service you cannot well do without.

Boiler Design, Construction, Operation, Repairing and Inspection

By H. S. Jeffery

Repairing Boilers.

When applying a patch to a boiler the type of boiler has a marked bearing on the type of patch that should be applied; likewise how the patch should be applied. If the bottom of a tubular boiler

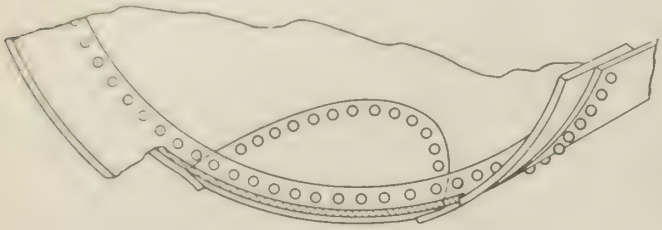


Fig. 27.

is defective and a small patch is to be applied adjoining the centre girth seam, a patch as shown in Fig. 27 should be applied. It is frequently called a horse-shoe patch. The illustration, Fig. 27, shows that having cut out the defective shell sheet, the girth seam rivets when replaced hold a portion of the patch in place. It is essential to scarf the plate at points A, Fig. 27, in order to cause no abrupt openings at the three thickness of plate.

If the shell plate is defective adjoining one of the flue heads and a patch, horse-

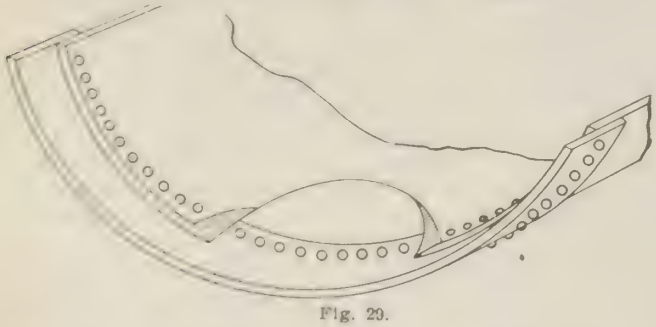


Fig. 29.

shoe style is applied, the corners A of the patch should be scarfed as described in the foregoing instance. This is illustrated in Fig. 28, this being the case whether the patch is applied to the large or the small course of the boiler.

The patch, Fig. 27, is an illustration of a patch applied to the large course of the tubular boiler. If the patch is to be applied to the small course of the boiler the method is similar, except the shell sheet is scarfed instead of the patch. This is illustrated in Fig. 29, the points A being scarfed. If the sheet is not scarfed as indicated in Fig. 29, then the patch when applied would have an offset as indicated in Fig. 30 at the points A.

The object of the horse-shoe type of patch is to prevent placing in the longitudinal plane a single riveted joint. Such a patch, and in fact every patch applied to the bottom of a tubular boiler should be riveted in place—never apply with patch bolts. The shell of a tubular boiler is a vessel, and, accordingly differs from the firebox of a locomotive boiler or the combustion chamber of a marine boiler, where a patch can be applied with patch bolts.

The shell of a tubular boiler when under steam pressure is under tension—that is, forces acting upon the shell tending to pull it apart. Now, with the furnace sheets of a locomotive type boiler, the chief consideration is to keep the plates from deformation, or bulging. For this reason staybolts are placed at given intervals, thus supporting the sheet to carry the load.

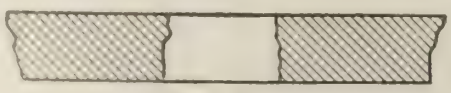


Fig. 31.

The firebox or the furnace sheets of locomotive, traction and other types of boilers, crack from staybolt hole to staybolt hole. The causes leading to the cracking are many. The punching of the staybolt holes frequently cracks or fractures the plate around the holes, this being especially true if the holes are punched with a dull punch and a large die.

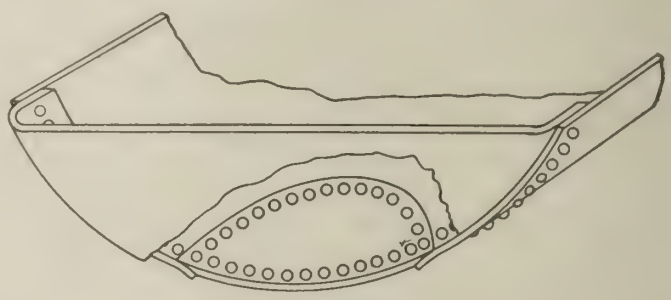


Fig. 28.

Punched holes make a rough and irregular hole in the plate as indicated in the illustration, Fig. 31. For this reason many authorities require that all rivet holes which are punched shall be punched one quarter inch or so smaller than the diameter of the rivet to be used and then reamed out.

While this practice is carried out by many in regard to rivet holes, it is not carried out extensively throughout the country in regard to staybolt holes. The common every day practice seems to be to punch the staybolt hole about one-eight inch less in diameter than the diameter of the staybolt—some punch the hole three-sixteenths less in diameter than the size of the staybolt.

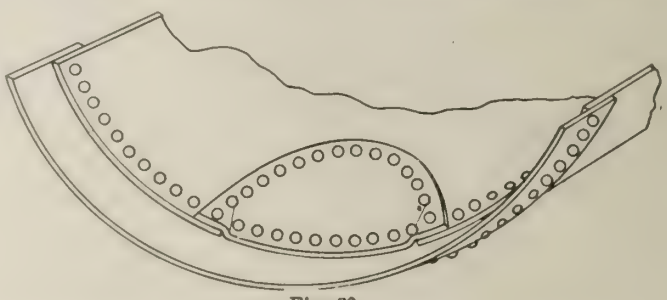


Fig. 30.

While the furnace sheets are usually light compared to other sheets of the boiler—and they are made thin to make easy transmission of the heat through the plate to the water within the boiler

the staybolt holes are nevertheless irregular if punched, though not so irregular as rivet holes in heavy plates.

The fracturing of the plate by punching permits a starting point from which the crack extends and many times extends from staybolt hole to staybolt hole. At the outset the crack may be repaired by placing in the sheet a small plug as indicated in Fig. 32. A small hole is drilled into the crack, after which the hole is tapped and a plug screwed in and then riveted and calked over. The number of plugs depends upon the length of the crack, and where more than one plug is required, it is the practice to install the plugs so that they overlap.

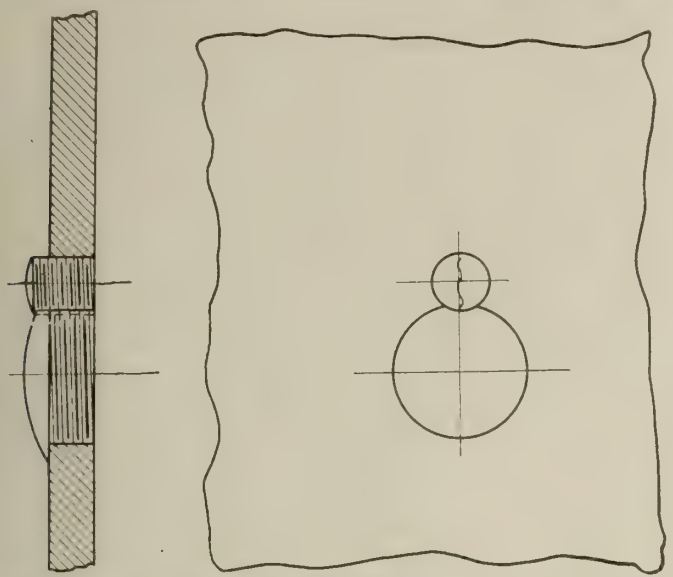


Fig. 32.

Thus if a crack one inch long is to be plugged, the first plug would be the plug A, Fig. 33, which would be placed at what was supposed to be the end of the crack, though this point is often hard to ascertain, for the crack may be of a character that it cannot be fully traced from the side or point from which the examination is made.

After plug A is installed, then plug B is installed, after which plug C is installed. It will be seen that plug C overlaps plugs A and B, and after all the plugs are installed they are riveted and calked over to form a ridge, the whole process being known as SEWING UP A CRACK. The plugs are usually about three-eighths inch in diameter and threaded twelve threads per inch.

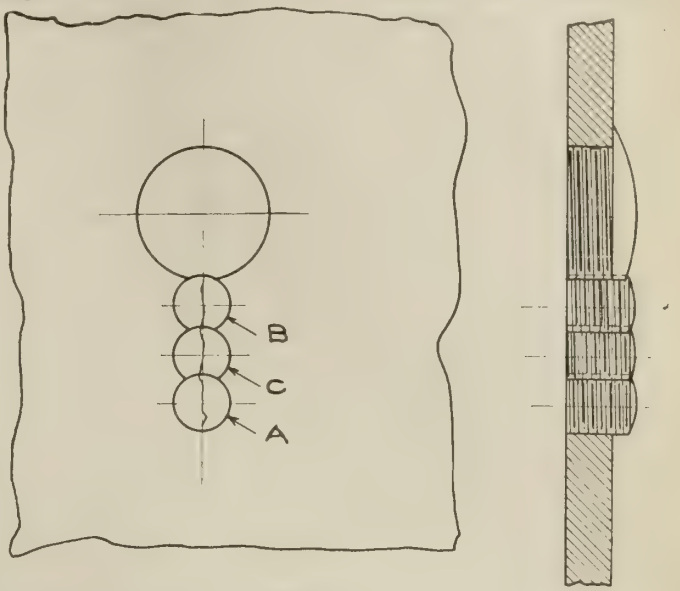


Fig. 33.

POWER EQUIPMENT & APPLICATION

Expert Descriptive Articles Dealing with Selection and Purchase of Most Suitable Power Equipment for All Purposes, its Proper Application, Installation, Operation and Treatment.

SPUR GEARS.

By G. D. Mills, Montreal.

IN introducing this article on Spur Gears, the writer has aimed to provide a reliable guide for the designer or manufacturer, together with a collection of reference tables and formulae, which can be followed with confidence.

Classification of Spur Gears.

Spur gears may be classified as Gears connecting parallel shafts by teeth which mesh as they roll on their axis. The proper arrangement of the teeth is accomplished by means of tangent circles, known as the pitch circles of the respective wheels. On these lines the teeth are wove, so that they mesh correctly, and have sufficient space at the tooth bottom to clear each other. The pitch circles, although merely constructional, are nevertheless the most important lines in the design of spur gears, and always define the centre of the working depth of teeth.

The addendum or upper half of the working depth of tooth therefore projects from each pitch circle, and meshes with the addenda of the mating wheel, which is equal to it in length. The working depth of tooth is addendum x 2, and by adding clearance, we get the total depth of tooth.

Tooth Parts and Wheel Dimensions.

In the diagram Fig. 1, will be found two tangent pitch circles, as in all spur gears. Fig. 1 is an explanatory diagram, describing the tooth parts and dimensions of wheels. The radial lines denote the tooth centres; the circular pitch being the circular distance from the centre of one tooth to the centre of the tooth adjoining, measured on the pitch circle. The width of tooth is one-half the circular pitch in cut gears, and the table of tooth formulae is arranged so that any part may be readily determined in a variety of ways, thus giving wide scope to ready calculation; a convenience appreciated by those who have practical designing to do.

The diametral pitch is the standard which governs all tooth dimensions, and represents the number of teeth to each inch of pitch diameter. It is the pitch number of the wheels. With any one diametral pitch, we are obliged to have the same circular pitch, addendum, clearance, full depth, and width of tooth, irrespective of what the pitch diameter or number of teeth may be. From this it will be seen that we have three quantities to consider in designing spur gears; the number of teeth, pitch diameter and diametral pitch, which is essentially the size of tooth. The pitch diameter and number of teeth bear equal proportions, and the diametral pitch is the ratio of the pitch diameter and number of teeth. Its reciprocal is the addendum, or one-half the working depth of tooth. The relations which the pitch diameter, number of teeth, and diametral pitch bear to one another are expressed in the formulae

$$P=\frac{N}{D} \quad D=\frac{N}{P} \quad \text{and} \quad N=D.P.$$

The relation which the addendum bears to the circular pitch is, as the diameter of a circle

to its circumference, or the addendum multiplied by 3.1416, equals the circular pitch. The tooth formulae represents the best modern practice in gear design, and should be followed carefully.

Basis of Calculation.

In Spur Gears we have a variety of conditions and our calculations are based mainly on the speed ratio required for the gear and pinion. We may have the pitch diameters to determine from the distance between centres and speed ratio, or the distance between centres can be calculated from the number of teeth in the wheels and the diametral pitch. It may also be necessary to calculate the strength of the teeth in the wheels. Accompanying is a table of tooth parts arranged from 1 to 10 diametral pitch, and from this table any size tooth may at once be selected, and its diametral pitch

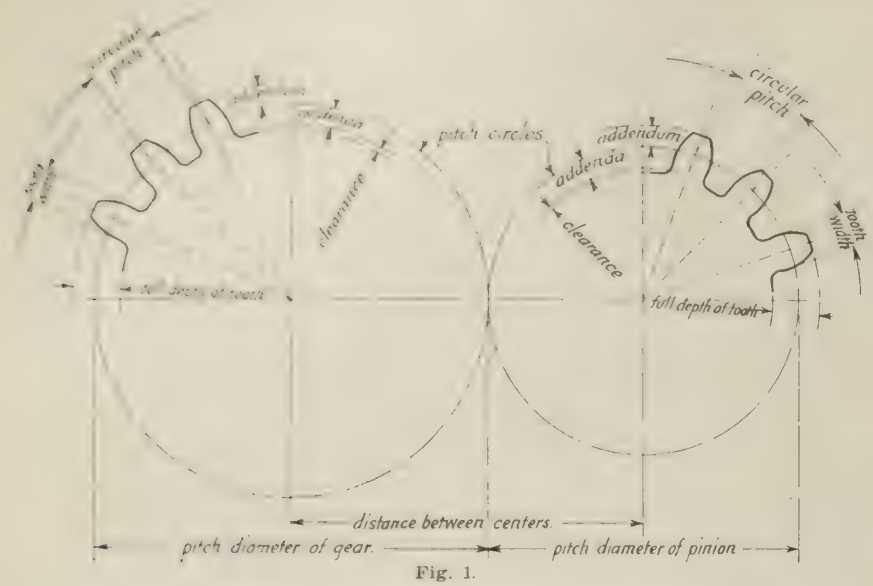


Fig. 1.

ascertained. If the desired diametral pitch is not in the table, its parts can be found by dividing the parts of 1 diametral pitch, by the desired diametral pitch, and while gear cutters are usually arranged in even diametral pitches, there are some cases in which an even diametral pitch will not answer. Should the conditions call for a pitch diameter and speed ratio that will not permit of an even diametral pitch, it will be necessary to have a special cutter or two made to cut the wheels.

The face length of teeth is said to be in good proportion, when it is 2½ times the circular pitch. This, however, is variable, as it may be desirable in the case of light loads to reduce the length in order to effect a saving in material and space, or to increase it, to carry heavy loads. The face length of teeth is part of the formulae for ascertaining the strength of gear teeth, and is treated later on. The formulae for determining the pitch diameters from the distance between centres and speed ratio is as follows:

$$\text{Pitch diameter of gear} = \frac{C}{R+r} \times r \times 2$$

$$\text{“ “ “ Pin.} = \frac{C}{R+r} \times R \times 2$$

In which C=distance between centres.
R=ratio term of gear.
r= “ “ “ pinion.

If the speed ratio was 5 to 1, the ratio term of the pinion would be 5, and that of the gear 1. The distance between centres may also be determined by the formulae.

Tooth Parts.

Diametral Pitch	Circular Pitch	Thickness of Tooth	Addendum	Depth of Tooth	Working Depth	Face of Tooth
1	3.1416	1.5708	1.0000	2.1571	2.0000	5
1¼	2.5133	1.2566	.8000	1.7257	1.6000	4
1½	2.0944	1.0472	.6666	1.4381	1.3333	3⅓
1¾	1.7952	.8976	.5714	1.2326	1.1428	2⅞
2	1.5708	.7854	.5000	1.0785	1.0000	2½
2¼	1.3963	.6981	.4444	.9586	.8888	2⅜
2½	1.2566	.6283	.4000	.8628	.8000	2
2¾	1.1424	.5712	.3636	.7844	.7272	1⅞
3	1.0472	.5236	.3333	.7190	.6666	1¾
3½	.8976	.4488	.2857	.6163	.5714	1½
4	.7854	.3927	.2500	.5393	.5000	1¼
5	.6283	.3142	.2000	.4314	.4000	1
6	.5236	.2618	.1666	.3595	.3333	⅞
7	.4488	.2244	.1429	.3081	.2857	¾
8	.3927	.1963	.1250	.2696	.2500	⅝
9	.3491	.1745	.1111	.2397	.2222	⅝
10	.3142	.1571	.1000	.2157	.2000	½

Gossip of the Trade

The Canada Metal Co. have moved into new and spacious premises on Fraser Avenue, Toronto, from whence they will continue to send out their numerous well-known brands of babbitt metal, phosphor bronze, copper ingots, etc. The business was started 30 years ago on William Street, Toronto, by W. G. Harris, president of the company, and has gone steadily ahead since, until it is now favorably known from coast to coast. The Canada Metal Co. makes a number of brands of babbitt, one of the best known being the Harris Heavy Pressure brand, designed especially to overcome the troubles of soft bearings that squeeze out, and of hard bearings that crack in the box or cut the shaft.

The Smart-Turner Machine Co., Hamilton, report the following orders recently received: H. J. Hogan, Port Colborne, Duplex pump; Samuel McMahon, Revelstoke, B.C., single-acting vertical power pump; the Alabastine Co., Caledonia, rotary pump; the St. George Condensary Co., St. George, steam pump; the Sincennes-McNaughton Line, Montreal, Que., side suction centrifugal pumps; the Corporation of Grimsby, centrifugal pump; the Hamilton Oak Tanning Co., Woodstock, Ont., horizontal duplex power pump; Gunns, Ltd., West Toronto, side suction centrifugal pump, direct connected to motor; the Page-Hersey Iron Tube & Lead Co., Guelph, single-acting triplex power pump; Wm. Clark, Montreal, side-suction centrifugal pump; the Trenton Canning Co., Trenton, Ont., duplex pot valve pump; Thos. Ivey & Sons, Port Dover, duplex double-acting power pump.

The Canada Steam Pump & Machine Co., 97 Richmond St. E., Toronto, recently completely overhauled the turbines and auxiliary machinery of the S.S. Turbinia, which plys between Toronto and Hamilton. After running for seven or eight years some parts of the machinery had got into poor shape, one of the centrifugal circulating pumps being considerably out of balance, necessitating a new shaft. The original shaft had worn one inch below size. The pistons of the high-speed engine driving the centrifugal pumps were worn 3-16-inch, and owing to the shortness of the connecting rods, together with the slackness of the cross-heads and gudgeon pins, the cylinders themselves were badly scored, and had to be re-bored. A new feed water heater was also installed and the whole equipment put in first-class shape.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

LIMITATIONS ON SCIENTIFIC EFFICIENCY.*

By Henry G. Bradlee.**

IT would, no doubt, be presumptuous at this time, said Mr. Bradlee, to place a limit on what may be accomplished in the future through efficiency methods, and certainly no one would wish to criticise or suggest weak points in these methods, were it not for the fact that the public may be misled by exaggerated statements and may unreasonably condemn those who are doing most to develop and direct our industries. In view of the statements which have been made, it certainly seems reasonable and proper for us to consider whether there are not some practical limitations which have prevented a general adoption of these methods in the past, and which may prevent the wholesale overturning of our present industrial system prophecied by certain efficiency engineers.

Efficiency Engineering Methods.

Stripped of technicalities, the method of the modern efficiency engineer is simply this: First, to analyse and study each piece of work before it is performed; Second, to decide how it can be done with a minimum of wasted motion and energy; Third, to instruct the workman so that he may do the work in the manner selected as most efficient. There is nothing fundamentally new in all this. The underlying principle is being used to-day to a greater or less extent in all industries, and has, no doubt, been used at all times in the past. Let us keep this fact just as clear in our minds as possible.

The method employed by the modern efficiency engineer is distinctive, not because it is new, but because it embraces much greater detail. As I have already indicated, we are all familiar with the general principles underlying the modern methods; and many of us make frequent use of these principles in the conduct of our business. I think I am correct in saying that in the business with which I am connected, every general principle and every detail method which has been suggested by the efficiency engineer has been used at one time or another, and many are in use to-day. The subject is then a familiar one to all of us; the problem presented is not the adoption of something entirely new, but rather the extension to every detail of our work of something which we have already tried.

When we look at the matter in this light, we naturally ask ourselves, is it in all cases practical and desirable to extend these methods to all parts of our work, and if not, under what circumstances may it be done to best advantage? It would be impractical to fully answer these questions within the limits of a short paper, but we may suggest very briefly a few factors which seem likely to limit the practical working field of the efficiency engineer.

Examples of Highest Efficiency.

Scientific management will clearly yield its best results when the labor performed consists of a continuous repetition of some definite set or series of sets, and when the work is carried on under conditions which remain practically uniform. The second important factor is that the work of the different employes shall be reasonably uniform in character and not extremely diversified. Further, the extent of territory which a business covers may make it difficult, or entirely impracticable, to use the methods which give greatest success when applied to a group of men working in a single building.

Where, then, shall we look for work to which efficiency methods may be successfully applied? Where can we find a considerable number of men, located near together, preferable in a single building, all doing the same kind of work under conditions which remain practically uniform, and the work itself consisting of a continued repetition of some definite act or series of acts? Work of this character will presumably be found in certain mills, factories and shops, and in some special departments of other industries. These are the places, then, where we may expect the efficiency engineer to meet with the greatest success, and if we may judge from the examples quoted, it is in just such places and under such conditions, that the best results have so far been secured. When we have given the limitations the consideration they deserve, I think we will reasonably conclude that we are not likely to see any sudden and remarkable increase in industrial efficiency.

The efficiency engineer may easily prejudice his own cause by making exaggerated claims and statements of what he can accomplish. He may discredit his own profession by criticizing too freely the work and methods of others or by rashly condemning the efficiency of our present industrial organization.

*Abstract of paper presented before the Congress of Technology at the Fiftieth Anniversary of the Granting of the Charter of the Massachusetts Institute of Technology.

**Member of the Firm of Stone and Webster, Boston, Mass.

SCIENTIFIC INDUSTRIAL OPERATION.*

By Tracy Lyon.**

IT is natural to assume, said Mr. Lyon, that when a man has worked at one task for years, whether on a machine tool or at manual labor under ordinary competent supervision, and with the advantage of his own experience and trade traditions, he has reached a degree of skill and speed which could be increased by expert instruction to only a small degree. But this is not so and therein lies the keynote of scientific management. It has been demonstrated that a man can be taught to double or even quadruple his output, with no greater, and with even less physical exertion, by means of a use of tools and a distribution of effort, which unaided he would be incapable of evolving.

Conditions Necessary to Efficiency.

In order to bring out the best and most intelligent effort on the part of most men, it is necessary to establish and recognize a reasonable measure of their efficiency, and to develop same to its highest degree. Further, there must exist methods of compensation which will offer comparatively large returns for increased individual effort and an organization which will effectively plan in advance, to bring together at the right time all information, tools and material required,, and in addition, furnish adequate instruction and supervision with carefully considered arrangement of appliances and machinery to bring about the economical movement of work. A very essential function of such an organization is to create a feeling of co-partnership between employer and workman, and an understanding that the employer is not trying to get the most work for the least wage, but is willing to pay liberally for increased output and efficiency.

Many manufacturers do not know what the real and actual cost of their product is, particularly if it is diversi-

*Abstract of paper presented before the Congress of Technology at the Fiftieth Anniversary of the Granting of the Charter of the Massachusetts Institute of Technology.

**The Westinghouse Electric Co., Pittsburg, Pa.

fied, because of a lack of adequate cost accounting and because the overhead or general charges are not properly distributed. This is to their own detriment as well as to that of the public, and while not an easy question to solve, there are, nevertheless, scientific methods of accomplishing it. I believe that railroads, for instance, would purchase many articles they now manufacture if they had a truer knowledge of their shop costs. Railroad shops have no balance sheets to face, and do not necessarily go out of business if they are not making money.

NEW STEEL PLANT IN OPERATION

The National Bridge Co. of Canada, which was organized in December last, and work first started on its new buildings near Dominion Park, Longue Pointe, Montreal, has made its first shipment of finished steel. Power was turned on a few days ago, and the shop machines put in operation, resulting in the first shipment for customers' contracts, within about 48 hours from the start.

This is a new record in rapid construction, for a large industrial plant in the Dominion.

AN INTERESTING REPORT ON CANADIAN TRADE.

His Majesty's Trade Commissioner for the Dominion of Canada, Richard Grigg, has just made a report to the Board of Trade, at London, England, on the trade of the Dominion of Canada for the period from July 1, 1906 to March 31, 1910. The report covers nearly every phase of Canadian operations and is divided roughly into three parts:

(1) A general survey of the economic conditions of the Canadian market.

(2) The import trade of Canada.

(3) A survey of particular branches of trade.

Trade conditions for the period named are analyzed very carefully and the figures relating to labor and to some of the principal commodities used by engineers and contractors are of practical interest.

LARGE FAN.

One of the largest fans yet made is illustrated herewith. It is over 32 feet high, and was made by the Buffalo Forge Company. It is used in connection with a heating, ventilating and air conditioning system, supplying 25,000 cu. ft. of air per hour to every employe in the new mill of the Sharpe Mfg. Co., New Bedford, Mass., the largest individual yarn mill in that city.

In this mill particular consideration has been given to the hygienic conditions of operation. The air is washed before entering the mill, all dust, dirt and foreign matter being removed; leaving the air absolutely clean. In winter the air is heated to any desired temperature, a feature being independent regulation on each floor. Provision is also made for cooling the air, so that in the hottest days of summer the temperature throughout the mill, even in the spinning room where the machinery generates an immense amount of heat, will be from 15 deg. to 20 deg. cooler than is possible by ordinary window ventilation.

The volume of air that the fan handles to achieve these results reaches the astonishing total of 20,000,000 cu. ft. per hour. The conditions thus obtained are as near ideal for this kind of work as it is possible to make them.



Buffalo Forge Co. Fan.

Catalogues

We have received from H. W. Petrie, Ltd., Toronto and Vancouver, a copy of the 1911 edition of their machinery catalogue. The contents run to 156 pages, and set forth by text and illustration the varied and wide scope of the lines carried and the business handled. Careful perusal by those having to purchase equipment for large or small factories will be amply repaid by the mine of information it unfolds, and will instill confident assurance that even the most urgent requirements can be promptly met by Petrie, Ltd.

There is practically no line omitted from the list carried, which manufacturers daily require, and a copy of the catalogue on the purchasing agents' and superintendents' files will be a ready and reliable reference, carefully indexed. The firm, established away back in 1871, are keeping pace with and anticipating Canada's growth, and much credit is due to Mr. H. W. Petrie, whose photo appears as frontispiece, for the development of a business which has become a household word in the mechanical and agricultural fields from coast to coast. Copies of the catalogue may be had on application.

The Chain Belt Co., Milwaukee, Wis., have issued a new edition of their general catalogue No. 40, descriptive of elevating, conveying and concrete machinery. It is handsomely bound in book form, and contains 278 pages of text and illustration, referring to the many adaptations of the firm's manufacture in the fields indicated. In addition to equipment details, cuts are shown of installations of various types and for various purposes, enabling those in the market to form a good idea of what their requirement should consist and where to get it. Copies of the catalogue will be mailed on request, to responsible firms or their representatives.

John Millen, Sons & Co., Ltd., Montreal, Toronto, Winnipeg and Vancouver, have forwarded us their 1911 automobile and motor boat supply catalogue. It is, as usual, a most creditable production in the matter of text, illustration and artistic treatment generally. Increased business and prospects in the above direction have warranted the firm in increasing the size, and thereby the scope of the catalogue. Such a step means, of course, increased stock carried, and the desire to meet every requirement.

Automobiles and motor boats have come to form a large part of our very existence to-day, and have a tendency to become less of a luxury than a few years ago. This being so, the myriad details applicable and necessary for these machines has an interest for an increasing purchasing field, and to have the opportunity always at hand and be assured of satisfaction, this catalogue should be secured and its contents carefully noted. Sectional divisions, A for automobile supplies, and B for those of motor boats, make, together with the complete index, ready reference always available.

The Consumers Gas Co., Toronto, is at present engaged in erecting the largest gas holder in Canada. The capacity is five million cubic feet, and the construction work was carried out by C. & A. Walker, Donnington, Shropshire, England.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

SACKVILLE, N.B.—Additional railway facilities have enabled the Fawcett Manufacturing Co. to discard the horses and carts which have been conveying their exports and imports over the mile of road between the Foundry and the I.C.R. Station, and they are now in direct railway communication with the Pacific Ocean.

KINGSTON, ONT.—The Canadian Locomotive Co. find their present plant entirely inadequate to handle present orders and are preparing to double its capacity.

OTTAWA, ONT.—The Department of Public Works has issued a call for tenders for work in the harbor of St. John, N.B., which will probably bulk up to $8,000,000 or $10,000,000.

Contractors are asked to put in bids for a drydock and ship-repairing plant of the first class, for dredging Courtenay Bay, for the construction of three steamship berths, and a breakwater. All are to be bid for in the lump.

REGINA, SASK.—The Farmers' Steel and Wire Co. have plans for a six-storey warehouse and plant for the manufacture of wire and steel work. Only two storeys and basement will be built this year.

CALGARY, ALTA.—The Gordon Nail Works of St. John, N.B., have definitely decided to locate here, not at Medicine Hat as reported.

HAMILTON, ONT.—Three important new concerns are locating here, namely the Taylor Manufacturing Co., of Princeton, Ind., makers of steel bar clothing racks, etc.; the Boston Insulated Wire and Cable Co.; and the Mayo, Brown Co., a local concern which will manufacture steel stamps, dies, stencils and kindred articles.

NEW GLASGOW, N.S.—W. P. McNeil & Co. are said to have work under contract aggregating over $400,000. The big contracts include a machine shop and forge building for the N.S. Steel and Coal Co., at Trenton, a new shipping pier for the same company at Wabana, a rail fishing building for the Dominion Steel Co., at Sydney, a machine shop and forge for the Canada Car Co., at Amherst, a highway bridge across Wallace harbor and several other bridges.

ORILLIA, ONT.—The Canada Refining and Smelting Co. are extending their plant and will add four brick, one concrete, and two wooden buildings.

WELLAND, ONT.—Experiments were conducted here recently in the smelting of pig iron by electricity.

MONTREAL.—Thomas O. Sinclair, engineer and coppersmith, has assigned for the benefit of his creditors. His liabilities are $4,991 and assets $3,384.

TORONTO.—The new dock of the National Iron Works was opened recently. The company are installing a crane and magnet for lifting iron and steel, 10 tons to every load.

COBOURG, ONT.—The Crossen Car Works are preparing to erect new shops here.

CHATHAM, ONT.—Several local capitalists have decided to form a company with $20,000 stock to manufacture motor trucks. The plant will be quite extensive.

CHILLIWACK, B.C.—The B.C. Electric Railway are preparing plans for the construction of car barns and machine shops.

FORT WILLIAM, ONT.—The Lumby-Stenhouse foundry on South Syndicate Ave., was burned with a loss estimated to be in the neighborhood of $2,500.

LUNENBURG, N.S.—The Lunenburg Foundry Co. have installed a new lathe built by R. MacDougall & Co., Galt, Ont.

NORTH BAY, ONT.—The C. P. R. will erect new shops at North Bay to cost approximately $500,000.

BRANTFORD, ONT.—The Cumback Motor Co. are assembling machinery for the turning out of 50 motor trucks and if these prove successful a factory will probably be erected.

WESTPORT, ONT.—The ratepayers have voted a loan of $10,000 to the Westport Foundry Co. and a bonus of $2,000. The foundry was recently destroyed by fire.

FREDERICTON, N.B.—The N. B. Foundry has resumed operations and is being operated by electricity.

SYDNEY, C. B.—Rhodes, Curry, Ltd. have the contract to erect the new $98,000 general office building for the Dominion Steel Co.

GALT, ONT.—The Galt Machine Screw Co., a new concern, have secured premises and will manufacture machine screws, cap screws, set screws, special screws and parts of bicycles, autos and electric appliances.

MONTREAL.—The plant of the newest of the large steel companies in Canada, the National Works at Longue Pointe, is completed. The machinery has been installed, and the electric power used exclusively in the operation of the plant is being supplied by the Shawinigan Falls lines of the L.H. & P. Co. No steam is used except for heating purposes.

The capacity of the plant is 20,000 tons per year, which will be increased to 40,000 by the addition of a new shop building next year.

PRESTON, ONT.—The new 150 h.p. generator recently installed at Clare's stove foundry has been successfully tested and put in operation.

HERBERT, SASK.—Messrs. H. Sharman and L. C. Barry, mechanical engineers, are opening up a machine shop here.

REGINA, SASK.—The C.N.R. are calling tenders for a 10-stall roundhouse, engine room, machine shop and turntable for this city. The machine shop will be of an approved type, 86 ft. by 38 ft., and of substantial construction. The corner of the shop will adjoin the roundhouse.

MILTON, ONT.—The Imperial Foundry Co. have been in operation over one month. They manufacture hot water and steam boilers for heating purposes.

WELLAND, ONT.—The Welland Machine & Foundries are now manufacturing gasoline

Trenton

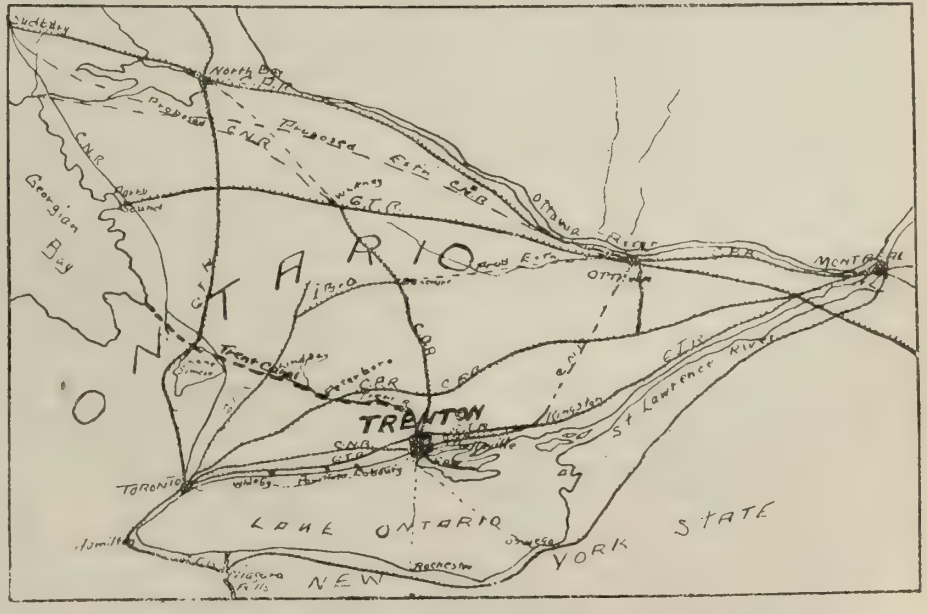
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From 1 8 to 3 4 of a pound of
ALUMINIUM GRANULES
to the ton of steel will increase the tensile strength of your castings without decreasing the ductility—it will produce smooth faced castings and avoid blow holes—therefore will reduce your loss in castings to a minimum.
WHY NOT ASK FOR SAMPLES TO-DAY?
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LONDON, - ENGLAND
General Agents: PARKE & LEITH, 60 W. Front St., TORONTO.

Jessop's Best Tool Steel
is yet unexcelled for cutting tools of all kinds, and for general machine-shop use.

Jessop's "Ark" High-speed Steel
gives marvellous results—heavy cuts -- at rapid speed; cannot be burned.

The favorite brands with users of good steel.
A large assortment of sizes in stock.
Jessop's high-grade files and rasps.

Manufactured by WM. JESSOP & SONS, Ltd. Sheffield, Eng.
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Our free booklet 223C tells you all about it,
JOSEPH DIXON CRUCIBLE CO. - JERSEY CITY, N.J.

engines, in addition to their regular line of contractors' machinery.

GALT, ONT.—E. Roelofson, formerly of the Parkin Elevator Co., of Hespeler is at the head of a new firm that will manufacture passenger and freight elevators.

HULL, QUE.—A company with a capital of $500,000 has been formed to locate a $100,000 plant here for the manufacture of a new drill or mine tester recently patented by C. Demerais, of this place. They will also build a plant in the States to cost $250,000. Associated with the patentee is H. W. Bagnall, of Ottawa.

WEYBURN, SASK.—C. J. Acton and W. B. Montgomery, of Carleton Place, Ont., are opening up an automobile garage and repair shop here.

SMITHS FALLS, ONT.—Rumor connects the Perrin Plow and Stove Co., with a contemplated merger, to be composed of a big wagon concern, a western steel truck industry and a large jobbing firm.

SYDNEY, C.B.—The Dominion Steel Corporation have placed the contract for a large nail mill to take the place of steel rod manufacture on which the bounty has been taken off.

FORT WILLIAM, ONT.—The Canadian Iron Corporation are preparing to extend their plant.

MONTREAL, QUE.—The Canadian Car and Foundry Co. will spend $200,000 extending their plant at Turcot and Dominion.

FORT WILLIAM, ONT.—$15,000 is being spent on a three-storey annex to the warehouse and machine shop of the Northern Engineering and Supply Co.

R. McDougall Co., Galt, Again Enlarge.

The R. McDougall Co., Galt, have let the contract for a new molding shop to Wm. Edmonds. The shop will be of brick and steel construction on a concrete foundation. This will double the capacity of the foundry.

MUNICIPAL.

DRESDEN, ONT.—The by-law to raise $16,000 for a waterworks system here was carried.

WELLAND, ONT.—W. H. Weller, of St. Catharines, has secured the contract for a portion of the increased waterworks power, the contract price being about forty thousand dollars. Contracts will be let later for pumphouses and other parts, the total expenditure being about seventy thousand dollars. This will give Welland town an entirely new supply of water and machinery for pumping. The old pumps and buildings will be kept as auxiliaries.

EDMONTON, ALTA.—That the city can erect and place in operation an artificial gas plant, equipped with the most modern machinery manufactured, at a cost not exceeding $230,000, is the substance of the report recently submitted to the city council.

QUEBEC, QUE.—The sum of $65,000 which was asked by the Waterworks Committee for improvements in Limoilon and in St. Sauveur was approved by the finance committee and recommended to the city council.

VANCOUVER, B.C.—R. S. Lea, of Montreal, has been appointed consulting expert engineer in connection with a comprehensive main drainage scheme for greater Vancouver, including the adjacent municipalities of Point Grey, South Vancouver, Burnaby and all the district between Burrard Inlet and the north arm of the Fraser River.

PORT ARTHUR, ONT.—The following by-laws, aggregating $163,755, will be submitted to the judgment of the burgesses: $6,000, improvements to municipal buildings; $10,000 towards construction of bridge over Current river; $9,000, extensions of telephone system; $17,250, extensions of street railway system; $16,505, sidewalks and streets; $75,000, extension of waterworks; $30,000, completion of storage dam at Current river. There will also be submitted a by-law to guarantee the bond issue of a company to be incorporated by J. L. McRae, to the amount of $30,000, and a by-law to provide that the city shall assume the sum of $149.70 annually for 18 years, local improvement charges for the widening of Banning Street; also a by-law to authorize an agreement between the city and R. B. McArthur, and to guarantee bonds to the amount of $35,000. Voting takes place on July 6.

SUSSEX, N.B.—A by-law to raise $15,000 for improvements and extensions to waterworks and sewerage systems has been approved by the ratepayers.

BRANDON, MAN.—The ratepayers have approved the by-law extending the franchise of the Brandon Gas Co. from 20 to 30 years, and the by-law to raise $25,000 by way of debentures for the purchase of rails for street railway.

BRIDGEBURG, ONT.—A by-law will be submitted to the ratepayers for approval, providing for sewer extensions, $8,000.

CALGARY, ALTA.—Negotiations are under way by which the Calgary Gas Co. will amalgamate with the Prairie Fuel Gas Co., and thus, if the amalgamation goes through, all the gas companies in Calgary will be under one head.

CAMROSE, ALTA.—The ratepayers carried the waterworks by-law here recently and it is hoped to have the system completed by next fall.

KAMLOOPS, B.C.—The following bylaws were carried by large majorities; $30,000 for extension of waterworks; $10,000 for extension of sewerage systems; $20,000 for automobile fire apparatus and an appropriation to buy a second lot for a large addition to the drill hall.

ST. MARY'S, ONT.—W. S. Brook, C.E., of Toronto, has prepared plans for a new sewerage system for this town.

NIAGARA-ON-THE-LAKE, ONT. — The Village of Niagara-on-the-Lake intends to have a waterworks by-law and, if possible, it is going to get the Government to pay part of the expense of the work, which is estimated at $21,500. The council has proposed to the Government that it should pay $1,000 as an annual rental for the supply of water at the military camp grounds.

WELLAND, ONT.—The citizens have carried a by-law to spend $75,000 on additions and extensions to the waterworks plant.

RIDGETOWN, ONT.—The waterworks by-law calling for a $35,000 system was carried here recently.

MONTREAL, QUE.—City Engineer Janin asks $4,000,000 for permanent works, including many miles of sewers for the new wards.

ELECTRICAL.

EDMONTON, ALTA.—The city has given the Allis-Chalmers Co. an order for machinery to cost $42,000. They will install a new 2,000 K.W. unit.

NIAGARA-ON-THE-LAKE, ONT .—The by-law submitted to the ratepayers to grant a franchise to the Frontier Electric Railway, was carried.

VICTORIA, B.C.—The municipality will spend $50,000 to extend and complete the lighting system.

BLYTH, ONT.—$5,000 will be spent for a steam pump and electric light purposes.

HAMILTON, ONT.—A by-law based upon the report of E. J. Sifton, the electrical expert engaged to estimate on the cost of a civic lighting and power distributing system, will be submitted to the ratepayers July 25th. It calls for an expenditure of $505,160.

MONTREAL, QUE.—Arrangements concluded here, resulted in a group of prominent Montrealers securing control of the largest water powers in the vicinity of Prince Rupert, the Pacific terminus of the G.T.P. railway. The local interests are headed by C. H. Cahan, K.C., president of the Western Canada Power Co. and H. A. Lovett, K.C. They will form the Prince Rupert Hydro-Electric Co., capitalized at $5,000,000, of which $3,000,000 has been issued. It is the intention of the company to develop about 1,500 h.p. by means of a provisional power plant to supply the immediate demands of the city of Prince Rupert, and to proceed to the construction of a permanent installation, capable of supplying 15,000 h.p. so soon as the G.T.P. railway is running into its Pacific terminus. The company will also control gas works in the city of Prince Rupert and will install a gas-producing plant capable of supplying 75,000,000 cubic feet of gas per annum for light and heating purposes.

VANCOUVER, B.C.—Tests are to be made on the new incinerator, now on a series of trials for general garbage destruction, with a view to ascertaining the possibilities of the machine for developing power for heating and lighting purposes.

PETERBOROUGH, ONT.—The Otonabee Power Co. are spending $200,000 to increase its equipment. A new plant with an estimated output of 4,000 h.p. will be installed.

SARNIA, ONT.—The ratepayers will be asked to vote in favor of a municipally-owned electric light plant.

EDMONTON, ALTA.—A by-law to provide $100,000, the expenditure for the initial work on the municipal power plant at Grand Rapids on the Athabaskan River, about 200 miles north of Edmonton, was defeated by an overwhelming majority. Citizens believed the scheme, which will cost between $3,000,000 and $4,000,000, too big a one for the city at the present time.

WEYBURN, SASK.—The town council have had under consideration the advisability of supplying a day current of electricity to those desiring to avail themselves of same and at the regular meeting held recently it was decided to put the plan in operation as soon as possible.

MILLTOWN, N.B.—A Toronto concern is anxious to establish an electric power and heating plant in Milltown, and has asked the town council for the privilege of installing and operating such a plant.

GENERAL MANUFACTURING.

CHATHAM, ONT.—A sugar factory with a daily capacity of one thousand tons will be built here. D. A. Gordon, M.P., of the Wallaceburg and Berlin factories, is interested.

ST. MARY'S, ONT.—The Hunt Engineering Co., of Iola, Kansas, have been engaged by the St. Mary's Portland Cement Co., composed largely of Toronto capitalists, for the construction of a building and plant with a daily capacity of 1,200 barrels.

WINNIPEG, MAN.—The Gilmour Soap Co., of Montreal, contemplate establishing a branch here.

TORONTO, ONT.—The E. W. Gillett Co. will build a new plant at a cost of $250,000.

WELLAND, ONT.—Frederic B. Stevens, Toronto and Detroit, recently supplied to the Quality Bed, Ltd., Welland, Ont., one No. 28 Collian cupola; to the Jones Machine Co., Chattanooga, Tenn., one No. 28 Collian cupola, and to the Sherwood Brass Works, Detroit; the Universal Motor Truck Co., Detroit; the Buting Brass & Bronze Co., Toledo, installations of the injector sand blast systems.

The Montreal branch of the H. W. Johnsmanville Co. moved from their offices in the Eastern Townships Bank building, Montreal, on May 1st, to a new location, No. 450-452 St. James Street. The building has five floors, and a full stock of their entire line will be carried.

John Sabin, formerly manager of the Bundy trap department of the American Radiator Co., Boston, has resigned to become general sales manager of the Nashua Machine Co., of Nashua, N.H., who have taken over the sales agency of the Bundy trap.

BUILDING NOTES.

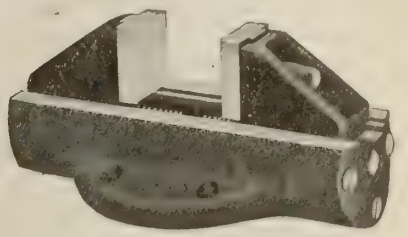
VANCOUVER, B.C.—C. F. Perry has plans for a seven-storey brick block 50x120 feet with stores on the ground and apartments upstairs.

TORONTO, ONT.—A handsome modern office building will be erected at 48 Adelaide Street East, on property recently acquired by Hon. J. H. Phippen, K.C.

VANCOUVER, B.C.—Albert Des Brisay will erect a six-storey brick building at a cost of $75,000. The first two floors will be utilized

Two-Jaw Box Chucks

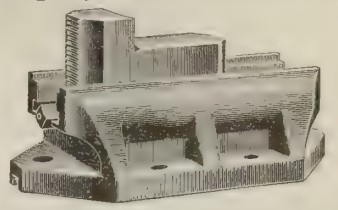
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Body and sliding jaws made from steel castings. Strong, durable--yet light in weight.

Face Plate Jaws

Have large screws with double thrust bearings. Specialfacilitiesforattaching.



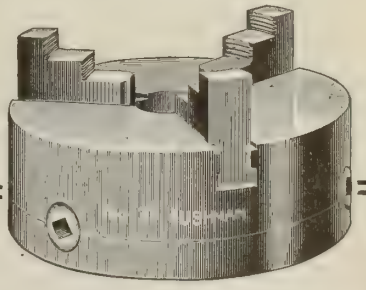
Ends pointed at 45 degs. so that four jaws will fit close together at centre Sizes 4 to 14 in.

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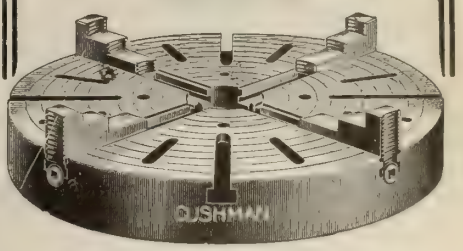
"CUSHMAN CHUCKS"

is now ready. Better write for it. It's free on request.

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For Rapid Production of Sheet Metal Stampings

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Any person, firm or corporation desiring to purchase this article will kindly communicate with the American Can Company, Montreal, P.Q.

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18 SATURDAY NIGHT BUILDING, TORONTO
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SCREWS THAT ARE THREADED TWICE
ARE THE KIND YOU WANT.
More Likely to be Accurate.
"MORROW" Set and Cap Screws are threaded twice. (Two dies over each screw).
Makes Morrow make uniform.
DON'T ALLOW ANY FIRM TO SELL YOU INFERIOR MAKES.
The JOHN MORROW SCREW, Limited, INGERSOLL

for mercantile purposes with the four upper floors for living rooms.

VANCOUVER, B.C.—Grant and Manderson have prepared plans for a five-storey block for A. Williams.

FORT WILLIAM, ONT.—The Oddfellows propose erecting a fine new building here. It will be equipped with the latest sanitary fixtures. Steam heat will be used throughout and an elaborate ventilating plant installed. Architects Hood & Scott, of this city, are in charge.

VICTORIA, B.C.—The Hudson's Bay Co. have purchased a site here and will erect a thoroughly up-to-date departmental store, the largest west of Winnipeg.

VICTORIA, B.C.—H. S. Griffiths has prepared plans for a six-storey block here to cost $80,000.

FORT WILLIAM, ONT.—The C.P.R. will spend $3,000,000 on improvements here, including a coal dock, wharf and plant capable of storing 1,000,000 tons of coal.

TORONTO, ONT.—A Montreal syndicate will spend $180,000 on an artificial ice rink here, on the present site of the Mutual street rink, which they bought for $120,000. The syndicate is composed of W. Wylie, R. Bedford, A. C. B. Claxton, Mr. Boswell and a number of others prominent in Montreal financial circles.

TORONTO, ONT.—Frank Wilson has secured a permit for a 9-storey office building to cost $125,000 at 77 Adelaide street west.

TORONTO, ONT.—The Toronto Furniture Co. have taken out a permit to build a $70,000 factory here.

PLANING MILLS.

DEER PARK, B.C.—Mr. Kenna, of Everett, Wash., representing a number of saw mill men, was here recently with a view to establishing a saw mill.

REVELSTOKE, B.C.—The Bowman Lumber Co.'s mill and plant, valued at $50,000, together with about five or six hundred thousand feet of storage logs, were destroyed by fire.

CRANBROOK, B.C.—The Campbell Lumber Co. are overhauling the old saw mill on the timber limits near Kitchener and expect to have it in operation by August 1st.

PRINCE ALBERT, SASK.—The Big River Lumber Co. now have, if not the largest, at least one of the most up-to-date saw-milling plants in the whole of Canada. It has been completed at a cost of $1,000,000 and stands on 150 acres of cleared ground. It is a three-band mill, with vertical and horizontal re-saw. One of the features of the plant is the planing mill, which is run by electricty generated on the ground. There are twelve boilers, each of 150 horse-power, a 1,800 horse-power engine to run the mill, and a 1,000 horse-power engine to run the dynamo which generates the electricity for the planing mill. The mill itself is fitted with all the latest devices for fire protection, including a complete sprinkling system.

COOKVILLE, N.B.—J. L. Hicks' large stationary saw mill was completely destroyed by fire recently. Loss is partially covered by insurance.

TORONTO, ONT.—W. H. Martin & Co., planing mill operators, builders, and contractors, Langley avenue, have assigned to N. L. Martin and Co., but a reorganization may be submitted to the creditors. The liabilities are estimated at $50,000, with the assets exceeding that amount.

BLAIRMORE, ALTA.—A. G. Peuchen, Toronto, has purchased Senator McLaren's saw mill, and took possession on May first.

VANCOUVER, B.C.—John Hanbury has erected here a million dollar plant, capable of turning out 1,000 doors a day. Mr. Hanbury has two large mills in the Crow's Nest country and another at Brandon.

NEW COMPANIES.

MONTREAL, QUE.—The Modern Gas, Light Heat & Power, Ltd., capital stock, $250,000, have been incorporated to manufacture and deal in gasoline and gas engines and all kinds of machinery appliances, plants and tools, etc. P. G. Majeau, insurance broker, J. A. Chognon, accountant; P. Durocher, advocate, all of Montreal; and J. D. Dufresne, manufacturer, of St. Hyacinthe, and P. Lacoste, advocate, of Outremont.

WINDSOR, ONT.—The Canadian Moloney Electric Co., capitalized at $150,000, have been incorporated to manufacture and deal in transformers, motors, dynamos, instruments, pumps, turbines, etc., etc. T. O. Moloney, manufacturer, D. McKenzie, hotel-keeper, J. W. Hanna, barrister, and O. Nartais, real estate dealer, all of Windsor.

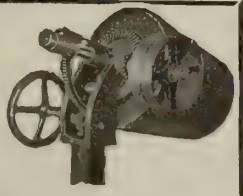
WINDSOR, ONT.—The Canadian Automatic Heating & Refrigerating Co., capital $250,000, have been incorporated to manufacture machinery, engines, motors, etc. T. W. Brown, commercial salesman, C. Wright, attorney, R. G. Hoke, insurance agent, and L. J. Shuck,

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Oil Tempered Steel Springs
—for every purpose and the best for each use.
Special styles of all kinds to order.
THE CLEVELAND WIRE SPRING CO.
Cleveland, Ohio.

stenographer, all of Detroit, and F. C. Kerby, of Windsor.

TORONTO, ONT.—The Cement Gun Co., capital $600,000, have been incorporated to manufacture and deal in all kinds of machinery, iron, steel, etc. G. H. Browne, promoter, and H. Wise, gentleman, both of New York; H. Hitch, contractor, Montreal; T. W. Horn and R. J. Cluff, manufacturers, both of Toronto.

TORONTO, ONT.—The General Machinery Co., capital $40,000, have been incorporated to manufacture and deal in engines, boilers, machinery, tools, air compressors, etc. H. H. Williams, manufacturer, B. W. Folger, A. E. Knox and E. L. Middleton, barristers, and F. Morrow, bookkeeper, all of this city.

ST. CATHARINES, ONT.—The Canadian Yale & Towne, Ltd., have been incorporated to manufacture and deal in safes, locks, safe locks, hinges, padlocks, and ornamental iron, door checks, chain hoists, etc., etc. H. R. Towne and J. H. Towne, of New York; W. C. Allen, of Stamford, Conn.; J. B. Milliken, of Montclair, N.J., and L. H. Porter, of Stamford, Conn. Capital $100,000.

TORONTO, ONT.—The National Electric Heating Co., capital $60,000, have been incorporated to manufacture and sell electrically-heated devices and other electrical appliances. B. Enusevsky, manufacturer, A. Pritzker, electrician, S. Harris, merchant, S. Enusevsky, married woman, R. MacGregor, gentleman, C. E. A. Dowler, bank manager, and J. B. Dalzell, solicitor, all of Galt, Ont.

MONTREAL, QUE.—The Standard Steel Works, capitalized at $1,000,000, have been incorporated to carry on the business of iron masters, steel makers, steel converters, and to manufacture and deal in iron, steel, machinery, etc., etc. G. V. Cousins and O. B. McCallum, barristers, P. F. Brown, secretary, W. R. Ford, clerk, and S. T. Mains, bookkeeper, all of this city.

JOLIETTE, QUE.—The La Fonderie du Peuple, Limitee, capitalized at $40,000, have been incorporated to cast, mold and smelt metals, and carry on the business of founders, etc. H. Desmarais, machinist, J. Lafleche and U. Chaput, merchants, J. A. Guibault and E. Hebert, advocates, and A. Boucher, broker, all of this place.

TORONTO, ONT.—The British-Canadian Shipbuilding & Dock Co., capital $10,000,000, have been incorporated to design, construct, enlarge, repair, complete, etc., etc., dry docks, floating docks, etc., and to carry on the business of shipbuilding, foundrymen, iron founders, brass founders, tool makers, machinists, etc., etc. Sir Henry Pellatt, Lieut.-Gov. Gibson, both of Toronto; C. Ellis, of Cyldebank, Scotland; A. Gracie, of Glasgow, Scotland, and A. C. Ross, of Sydney, N.S.

AN INTERESTING SHIPMENT.

Electrical and mill machinery and farming implements formed a large part of the cargo of the Japanese steamship, Canada Maru, which left port recently for the Orient on her maiden voyage out from Victoria. The liners of the Osaka Shosen Kaisha line carry large shipments of machinery on every voyage out from the Sound besides much other freight.

Machinery and farming implements leaving on the Canada Maru were valued at about $100,000. There were 467 cases of electrical machinery and fixtures, valued at $30,178, and 229 pieces of mill machinery, valued at $30,420. There were 118 pieces of farming implements, valued at $20,630; 22 pieces of engine machinery, valued at $250, and five pieces of laundry machinery, valued at $433.

PLACE STEEL ORDERS.

The Canadian Car and Foundry Co. has placed an order for 50,000 tons of plain structural material with the United States Steel Products Co. Plates and shapes will be rolled at the mills of the corporation. The prospect is also favorable for further important orders for finished steel, including rails for export to the Dominion. Canadian car shops are overflowing with orders, and locomotive works, too, are well supplied, while Canadian rail mills have their full capacity sold for a year. This is a marked contrast to the lean orders that have been placed by U.S. transportation companies with domestic equipment shops, the most important of which are running only 40 per cent. of capacity.

MONSTER INDUSTRY LOCATES AT HAMILTON.

Hamilton, Ont. has succeeded in inducing the Standard Underground Cable Co., of Pittsburg, to locate there and gets what will undoubtedly prove to be one of her greatest industries. The company have already let a contract for a $100,000 building, the first of the five or six to be erected at a cost of $500,000. As a starter, they will employ 300 hands and when in full operation its staff will number about 500.

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Special Machinery Designed and Made to Order.
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BELTING
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High Grade · Right Prices · Prompt Delivery
SATISFACTORY WORK GUARANTEED
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WOOD, BRASS
WHITE METAL OR IRON
by the very highest class of skilled mechanics.
Only the highest grade of material used in our work. We can handle your pattern work to your complete satisfaction.
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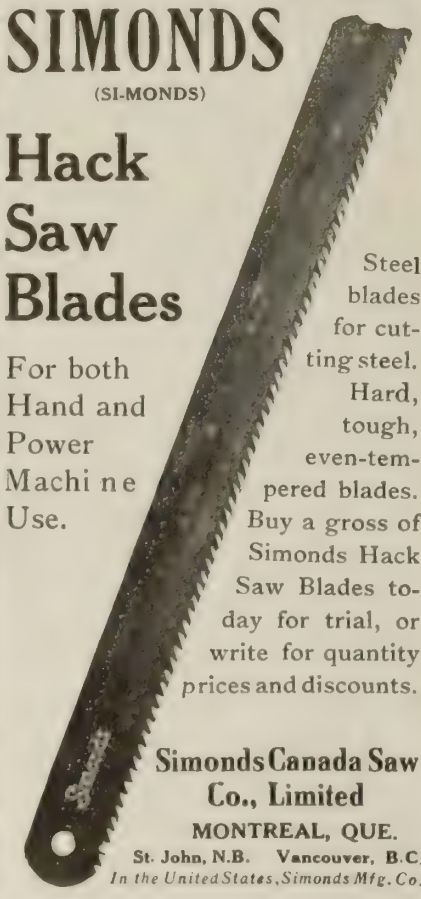
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At a meeting of the Steel Company held at Hamilton recently, the following directors were elected: C. S. Wilcox, Hamilton, president; Charles Alexander, Providence, R.I.; Hamilton Benn, London, Eng.; Lloyd Harris, M.P., Brantford; H. S. Holt, Montreal; W. D. Matthews, Toronto; Hon. Wm. Gibson, Beamsville; Cyrus A. Birge, Robert Hobson, William Southam and John Milne, Hamilton.

H. L. Peiler & Co.

H. L. Peiler & Co., agents for Canada of the Bundy trap, Mason's valves, etc., took possession on first May of new and very much larger premises at 380 St. James St., Montreal. Mr. Peiler's new office occupies the ground floor with show windows and is located in what is known in Montreal as "Machinery Row." This step has been necessitated by increasing business.

BOOK REVIEWS.

INDUSTRIAL PLANTS—By Charles Day, 294 pages, 5½x7½ ins., illustrated; published by the Engineering Magazine, 140-142 Nassau St., New York. Price $3.

As the arrangement and construction of industrial plants should be considered in scientific management, this treatise should greatly assist in bringing the plant up to a high state of efficiency and economy. In this book Mr. Day defines, in permanent form, the principles and the practical precepts of scientific plant construction. Chapters I. to VIII. inclusive of this excellent volume is founded upon a series of lectures delivered by the author before the Graduate School of Business Administration, Harvard University, and the engineering students at Columbia University. They have to do largely with the enunciation of broad industrial principles and a definition of the manner in which the arranging and planning of industrial plants should be conducted to arrive at the most satisfactory of these principles. One of these chapters is devoted to a fairly complete exposition of the use of the routing diagram as a basis of the laying out of industrial properties.

The other chapters give specific information on some of the important problems that enter directly into the metal-working plants, and particularly machine shop work. One chapter includes descriptions of the principal points of interest presented by a number of plants selected as illustrating the trend of modern practice. They exemplify results secured when the problems of planning and building are approached in a logical and thorough manner. Chapters XI. and XII. deal with the "Value of an Engineering Organization to the Project," and "Compensation for Engineering and Construction Service," respectively. This latter is of value to industrial managers as many of them are at a loss to know how to secure, for their own benefit, the economies resulting through the applications of the principles referred to in Chapters I. to XI. A copy of this book will be found of great value, therefore, to managers of industrial concerns.

ELECTRICITY EXPERIMENTALLY AND PRACTICALLY APPLIED—by Sydney Whitmore Ashe, B.S., E.E., author of "Electrical Railways," published by the D. Van Nostrand Co., 23 Murray and 27 Warren Sts., New York; 349 pages, 5½ x 7½ ins. Price $2 net. The treatise is for the beginner and for practical men dealing with electrical principles, experiments, practical applications and problems. It presents the subject from an experimental standpoint and in a very simple way showing the practical features. The volume is particularly adapted to courses of instruction given to those engaged in actual electrical work and should likewise prove useful as a text for high schools and for college laboratory courses. There are seventeen chapters arranged as follows: Magnetism, Electro-Magnetism, Electro-Magnetic Induction, Ohm's Law, Primary and Storage Batteries, Electrolysis, Three-wire System, Electrical Measurements, Shunt Motor, Series Motor, Incandescent Illuminants, Recording Wattmeters, Alternating Currents, A. C. Transformer, Induction Motor and the Rotary Converter. The subject matter is well illustrated, there being 422 illustrations used in the text.

HEAT ENGINES—By John R. Allen, Professor, and Joseph A. Bursley, Assistant Professor in mechanical engineering at the University of Michigan; 288 pages, 6 x 9 ins.; illustrated; published by the McGraw-Hill Book Co., 239 West 39th St., New York. Price, $3 net.

This book treats of steam, gas, steam turbines, and their auxiliaries and is prepared as an elementary treatise on the subject of heat engines, only those which are most commonly used being considered. It was written

primarily as a text book, the subject-matter having been used in the classes at the University of Michigan for a number of years. There are eighteen chapters dealing with Heat, Elementary Thermodynamics, Properties of Steam, Calorimeters, Combustion, Boilers, Steam Engines, Steam Turbines, Gas Engines, etc. Problems are given at the end of each chapter and the book is a useful one to the student of power.

WATER TURBINE PLANT—by Jens Orten-Boving, M.I.M.E., published by Raithby, Lawrence & Co., Thanet House, 231-232 Strand, London, W.C., Eng., 197 pages, 9x11 ins., illustrated. Price, 10s. 6d.

This book has been prepared primarily as a text-book dealing with the modern theory, design, and application of water turbines and accessories, and also as a catalogue. It is confined to the more purely mechanical portions of water power installations. It is interesting to note that the basis of the volume is a series of lectures which Mr. Boving read before the Japanese Association of Mechanical Engineers of which Mr. Boving is a member The letters were eventually privately issued in book form as a part of the journals of that Society; since that time they have become a text book for students of water power and its problems, in Japan.

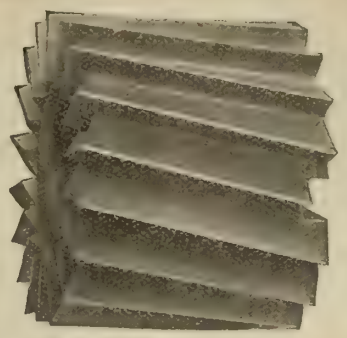
The work is divided into three sections (1) Theory and Tests. (2) Classification and Dimensions and (3) Description of Various Power Stations. This is very complete and of great value for the purpose for which it is written. Mr. Boving is president of the Canadian Boving Co., Toronto, who have made a number of installations in Canada. References to some of these are made in Part 3, notably among them being the plants at Winnipeg and Calgary.

ELECTRICAL POCKET BOOK—Annual Electrical Pocket Book and Diary for 1911, published by the Technical Publishing Co., 55 and 56 Chancery Lane, London, W.C., Eng., 3½ x 6 ins., 567 pages, excluding diary. Price, cloth, 1s. net; leather, 1s. 6d. net; postage, 3d. extra.

In this edition several sections have been revised and less important matters have given way to new items. The articles on the dynamo have been revised by C. C. Hawkins, M.A. Among alternations and additions which now appear are: Notes on the Ward-Leonard, Ilgner and Westinghouse rotary-converter equalizer systems; balancers and boosters; metallic filament lamps, Edison storage cells, re-arrangement of wire tables, etc.

DYNAMO ELECTRIC MACHINERY—Eighth edition, completely rewritten, dealing with Dynamo Electric Machinery; its construction, design and operation (direct current machines) by Samuel Sheldon, A.M., Ph.D.; D.Sc. professor of electrical engineering at the Polytechnic Institute of Brooklyn, and Erich Housmann, E.E., M.S., instructor in the Polytechnic Institute of Brooklyn; 5 x 7½ ins.; 328 pages, illustrated, published by the D. Van Nostrand Co., 23 Murray St., New York. Price $2.50.

The book has been written as a text book for use of students, the method of presentation being especially adapted to the classroom. With the exception of the first two chapters, the book has been entirely rewritten; nearly 200 of the illustrations are new, most of them having been especially drawn to make clear methods of construction and characteristics of operation; and it has been considerably extended in scope. In the new matter is included a set of problems at the end of each chapter, a presentation of the theory of commutation, means for the predetermination of the operating characteristics of direct current generators and mo-



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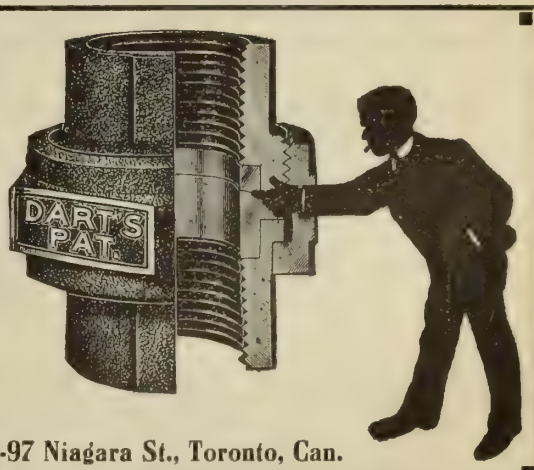
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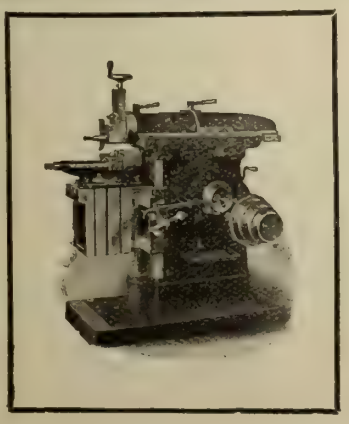
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FEED WATER HEATER.—The Stewart Heater Co., Buffalo, N.Y., have issued a booklet of illustrative and descriptive matter pertaining to the various types of Otis tubular feed water heaters, combined with oil separator and purifier. These are made for either exhaust or live steam in vertical or horizontal form. The heater body is of steel or iron boiler plate, riveted at the top end to a heavy cast iron ring, with projecting rim cast on its outer surface, forming a flange, to which the tube sheet and top dividing plate is attached by one row of bolts. The lower end of shell is riveted to a heavy cast iron conical bottom, and which is in the case of the vertical type, supported by four legs, forming a substantial base. The tubes are of seamless brass. Prominent among the features claimed for these heaters is the facility with which they can be cleaned, the certainty of precipitation of impurities in the heater before the water enters the boilers, the absence of back pressure, the fact that each tube may expand independently of the others, the extraction of the oil, the separation of the water of condensation and means for carrying it off. With one square foot heating surface per horse-power used water at boiling point is guaranteed from exhaust steam.

VULCAN SOOT CLEANER.—A booklet received from the Vulcan Tube Cleaning Systems, Ltd., 204 St. James St., Montreal, gives testimonial letters telling "what users are saying about the Vulcan soot cleaner."

SPRAY NOZZLES.—The Buffalo Forge Co., New York, have issued a booklet describing their spray nozzles and strainers. They cover such purposes as mine washing, gas washing, condensing plants, chemical plants, etc. The text and illustrations show their construction and detail their operation.



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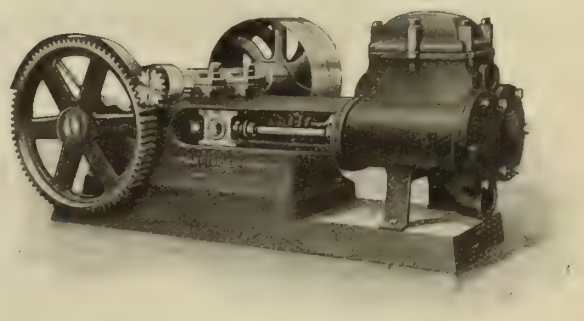
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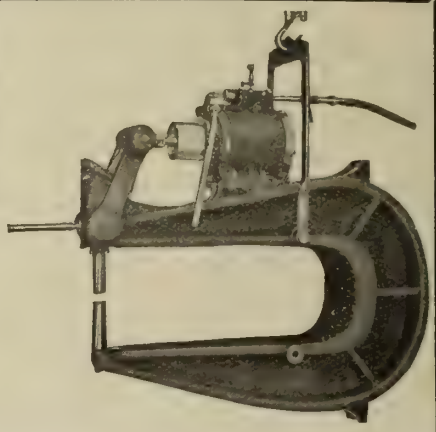
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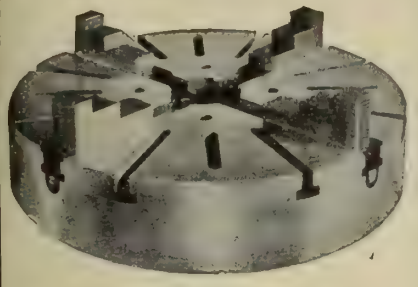
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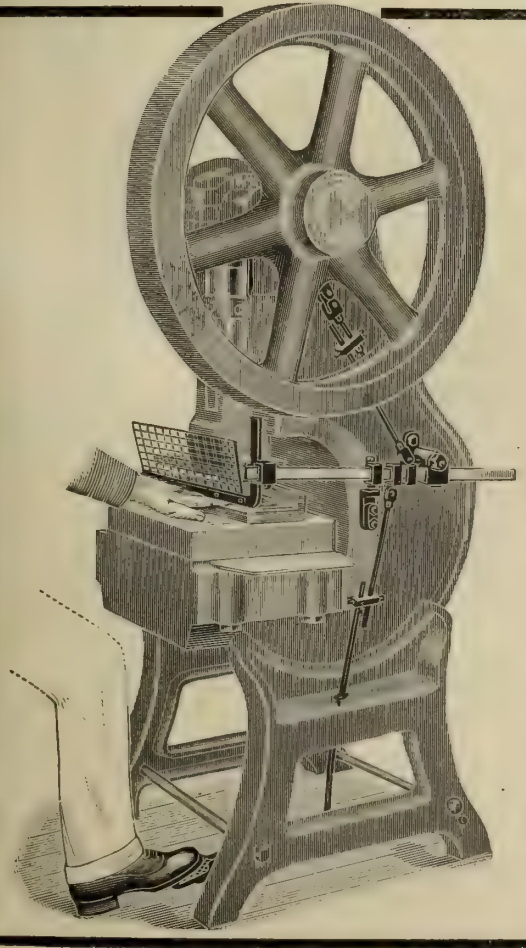
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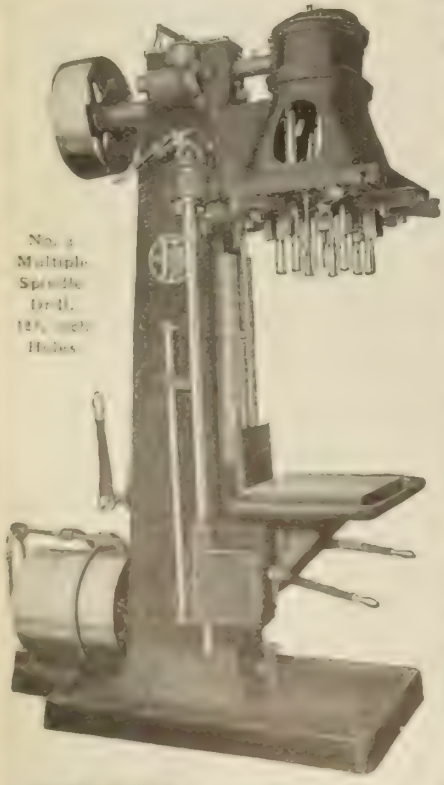
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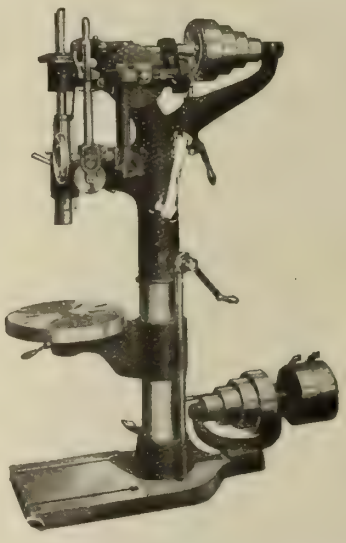
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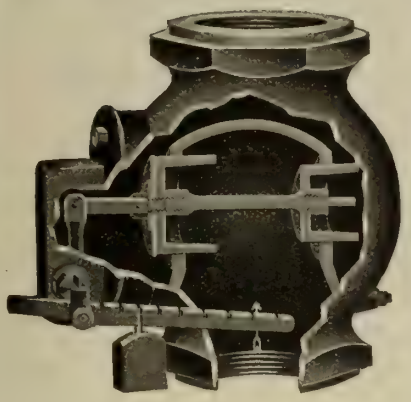
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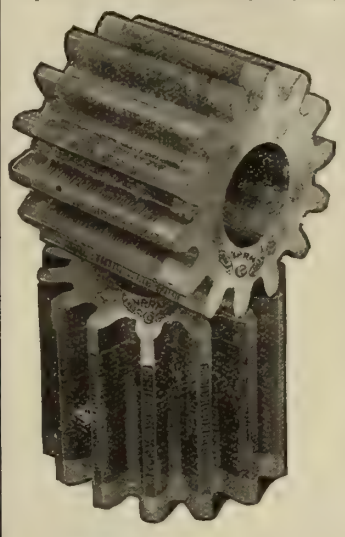
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Oneida Steel Pulleys are a quarter to a third the weight of cast iron and therefore save from two-thirds to three-quarters of the power required to revolve a cast iron pulley.

The oval crown face fits the belt perfectly, offering 20% better belt adhesion than any other pulley on the market.

Do You need Economy?
Get the Oneida.
It is the best.

SEND FOR OUR CATALOGUE

Oneida Steel Pulley Co.
Oneida, N.Y.

THE
LANCASHIRE DYNAMO AND MOTOR CO., Ltd.

152-4 Bay Street, Toronto

Motors and Generators —for— all purposes



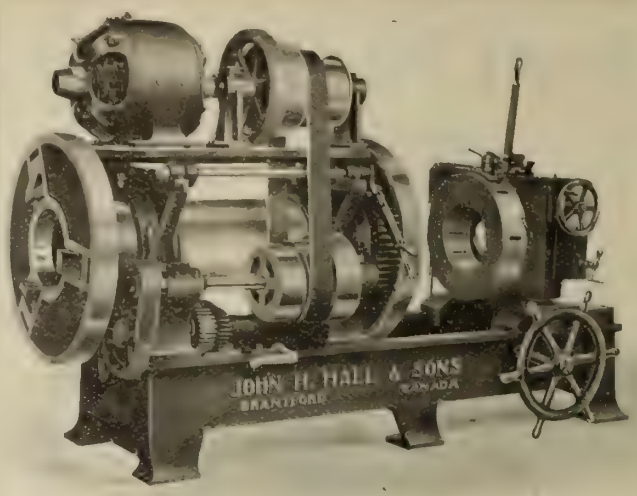
Often Imitated! Never Equalled!

Tallman's Reputation is in the Goods.

MANUFACTURERS OF

Finished Brass Goods
Brass Castings
Aluminum Castings

Tallman Brass & Metal Co.
HAMILTON, ONT.



PIPE THREADING MACHINES

Our No. 18, Duplex Improved, equipped with Peerless Die Head mechanism.

Capacity 8 in. to 18 in., either belt or motor drive.

Write us for prices on various sizes from 1/8 in. to 18 in. Also single and double head rapid nipple machines.

John H. Hall & Sons,
BRANTFORD, CANADA



High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

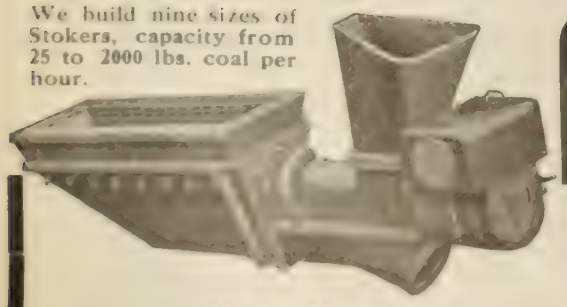
100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.

2305 Farmers Bank Building, PITTSBURG, PA.

EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO
Manufactured under Davy Bros., Ltd., Patents.

We build nine sizes of Stokers, capacity from 25 to 2000 lbs. coal per hour.



Write Now!

Our Furnaces Heat Steel with the Cheapest Fuel on Earth—

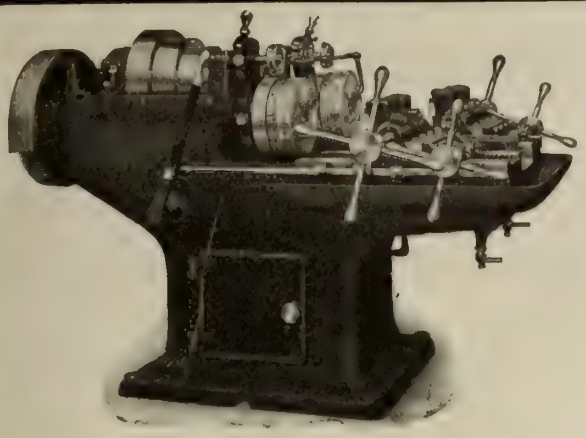
SOFT, SLACK COAL

They are all fired with "American" Mechanical Stokers, which burn bituminous slack coal automatically and without smoke, and give a clear, steady, soft, non-scaling flame. You get increased production, at about one-third to one-half the operating cost of oil or hard coal. This is a fact. If you burn money to heat steel why not burn less of it, and write us at once?

The Standard Engineering Company Limited

Rooms 209, 210 and 211, The Dominion Exchange Building. 14 King Street East, Toronto, Canada

The advertiser would like to know where you saw his advertisement—tell him.



Protected by Patents.

Heap's High Speed Screwing Machines

fully meet the demand for accurate and durable machines, unsurpassed in quality and containing the latest and best features for convenient operation, and large and accurate output. The perfecting of these machines did not happen at once; it took time and careful experimental preparation. Each of the new features embodied in these Screwing Machines has been under severe service and rigid test for a considerable period.

SEND FOR FULL PARTICULARS

Joshua Heap & Co., Ltd.,

ASHTON-UNDER-LYNE, ENGLAND

Canadian Agents: PEACOCK BROS., Montreal

Gem Shafting Lightens Labor



It enables you to take the tool to the work, instead of carting the work to the tool. Our Portable Emery Grinder is a high class general utility tool of wide range. It is *useful, practical* and *convenient.*

Write for catalog and remember—the *Gem guarantee is binding.*

GEM GUARANTEE GOOD



The Gem Oiler

is an economical oiler

It has a patent cleaning device that saves time and oil. It is exceptionally strong, machine made and interchangeable in all parts. Its durability is guaranteed. Made for all purposes.

Send for Gem Catalog.

Gem Manufacturing Co.

3257 Spruce Street

Pittsburg, Pa. U.S.A.

English Agents—A. A. Jones, Pollard & Shipman Co., Ltd., Church Gate, Leicester, England.

Grinding, Polishing and Buffing Machinery



Our combination Polishing and Buffing machinery is the most serviceable ever offered to an up-to-date machine shop.

It is perfect in design, well finished, and smooth running.

It has an unlimited guarantee to give highly satisfactory service in every respect.

Your interests are ours.

Write also for details of our Speed Lathes and Wet Tool Grinder.

J. G. Blount Company

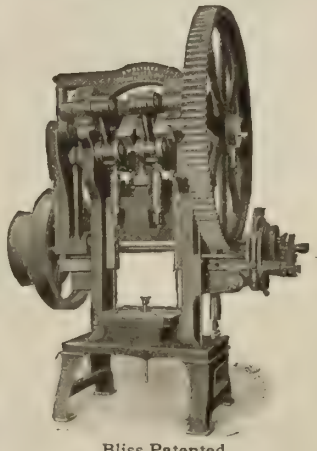
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BLISS

Bliss Toggle Drawing Presses

BLISS

Means Economy in Drawing Sheet Metal



Bliss Patented Toggle Drawing Press

They are built in sizes to cover all classes of work. When equipped with the "BLISS" Automatic Friction Clutch they can be started or stopped at any point of the stroke. The patented Toggle Movement insures a more perfect dwell, greatly increases smoothness of action, and effects a saving in friction and power. As fast producers of high-class work they are the leaders. Send samples for estimates, or write for Catalogue 5-G, illustrating these machines.

"Presses for Every Purpose."

E. W. BLISS COMPANY

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London Office---114 Queen Victoria St., London, E. C., England.

BUTTERFIELD'S



Taps, Dies and Reamers



The special hardening and tempering of Butterfield taps, dies and reamers have won popularity for them in many of the up-to-date shops throughout United States and Canada.

They are made from carefully selected material and are the result of 30 years' continued effort to produce quality goods at a reasonable price.

Butterfield's tools are thoroughly tested before leaving our shops, thereby assuring a reliable and serviceable product that has no equal.

Do not hesitate; our goods have an unconditional guarantee.

Write for details and prices.

Butterfield & Co.

ROCK ISLAND, QUE.

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Dominion Coal Company

Limited

GLACE BAY - - NOVA SCOTIA

Yearly Output, 4,000,000 Tons

High Grade Steam and Gas Coals

IMPROVED SCREENING FACILITIES at the Collieries for the production of Lump Coal of superior quality for Domestic trade and Household Use.

BUNKER COAL

Special facilities for quick bunkering of Ocean Steamers at Sydney and Louisburg.

For Prices and Terms Apply to:

Alexander Dick, General Sales Agent,
112 St. James Street, Montreal.

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171 Lower Water Street, Halifax, N.S.

and to the following Agents:

R P. & W. F. Starr, St. John, N.B.
Buntain, Bell & Co., Charlottetown, P.E.I.
Hull, Blyth & Co., 1 Lloyds Ave., London, E.C.
Harvey & Co., St. John's, Nfld.

Built For Service

"BARR" Combined Drilling and Tapping Machine

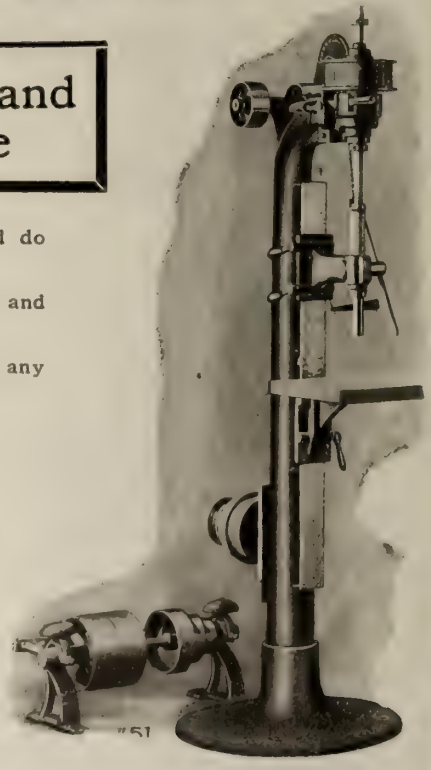
BARR combined machines will do better drilling and better tapping, and do them quicker than two separate drilling and tapping machines.

By installing the BARR you insure a saving in space, time, labor and handling.

We can also give you a power feed, lever feed, and tappers in any combination from two to seven spindles to a machine.

Don't tie up your capital in buying two separate machines.

WRITE US AT ONCE FOR PARTICULARS



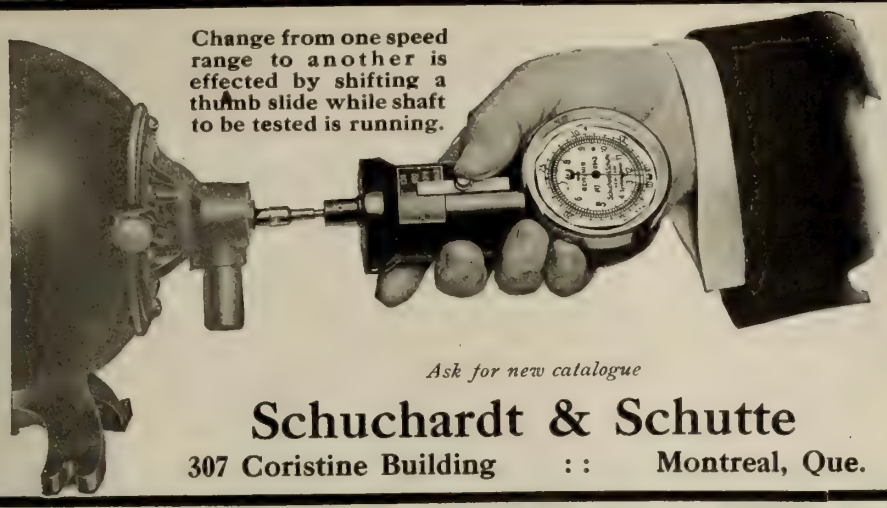
H. G. BARR, Worcester, Mass., U.S.A.

WILLIAMS & WILSON, Montreal—Agents for Eastern Canada

The General Supply Co., of Canada, Ltd.

OTTAWA TORONTO WINNIPEG

The advertiser would like to know where you saw his advertisement—tell him.



Change from one speed range to another is effected by shifting a thumb slide while shaft to be tested is running.

ONE SPINDLE FOR ALL SPEEDS

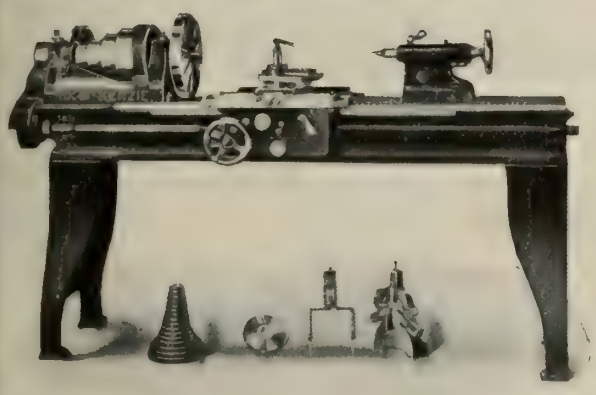
S & S Tachometers

Are the simplest, most efficient measuring devices, universally applicable for rotation and progressive speed.
They give an accurate, independent reading—no watch required—and instantly record the slightest speed variation on both right and left hand motions.

Sizes and styles for all requirements

Ask for new catalogue

Schuchardt & Schutte
307 Coristine Building : : Montreal, Que.



"McKenzie" Engine Lathes

are made in two sizes, 14"x6' and 14"x8' bed, from new patterns of an improved design.
They are manufactured from materials selected after many years of careful experimenting—materials that are the best.
The SPINDLE is of high carbon hammered steel, and runs in bronze bearings carefully hand scraped and finished.
The TAIL STOCK is of the cutaway type, allowing the compound rest to be set parallel with bed.
The COMPOUND REST is graduated in degrees, and both upper and lower screws have index collars.
This lathe has all gear feeds. Three changes of feed can be had by means of a friction gear on end of screw.
Lathe furnished complete with counter shaft, plain or compound rest, centre rest, follow rest, large and small face plates, wrenches and complete set of change gears.

Write at once for catalogue and specifications.

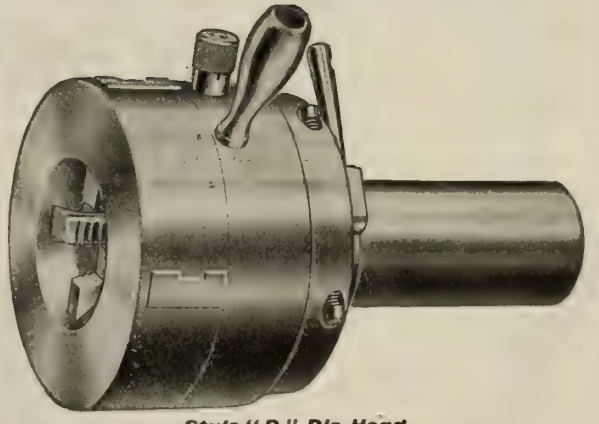
D. McKenzie, - Guelph, Ont.

Right or Left Hand Threads
Standard or Special Pitch Threads
Acme, Metric or other Special Threads

Also STANDARD PIPE THREADS, are cut with Geometric Self-opening and Adjustable Screw-Cutting Die Heads, applied to Screw Machines or Turret Lathes.

Tell us what kind of a thread you want to produce, and we will tell you how to do it.

We gladly answer all inquiries regarding our tools.



Style "D" Die Head.

Our Style "D" Die Heads are made in sizes from 1/8 inch to 4½ inches diameters, inclusive, and are furnished for every class of work.

Where work is of unusual or special character, we can make a Die Head to carry it out.



Our Style "D" Booklet gives full description. Send for one.

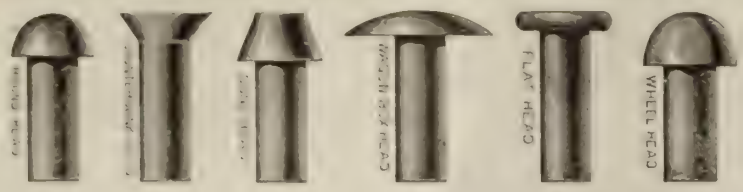


The Geometric Tool Company

New Haven, Conn., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Quebec; A. R. Williams Machinery Co., Toronto, Ont.

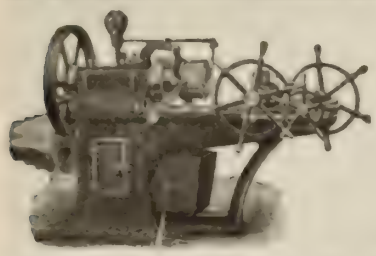
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We manufacture Rivets of every description, ½ inch dia. and smaller.

PARMENTER & BULLOCH CO., LTD.

GANANOQUE, ONT.



MODERN

Bolt, Nut and Forging Machinery and National Wire Nail Machines

THE NATIONAL MACHINERY CO TIFFIN, OHIO, U.S.A.

BOLT THREADERS, "WEDGE GRIP," BOLT and RIVET HEADERS, FORGING MACHINES, NUT MACHINES, ROLL THREAD MACHINES, Etc., Etc.

Complete Catalogue "E" upon request.

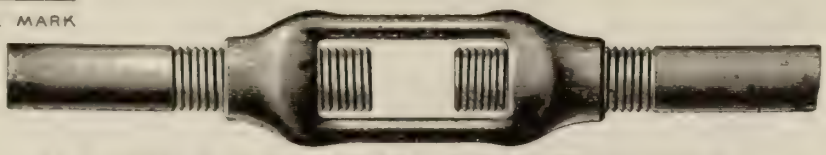
The National Machinery Co., Tiffin, O., U.S.A.

Canadian Agents: H W PETRIE, Toronto Ont

WILLIAMS & WILSON, Montreal, Que

B TRADE MARK

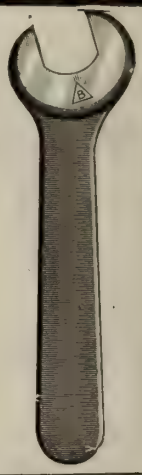
Drop Forged Turnbuckles



ALL KINDS OF SPECIAL DROP FORGINGS

Send Models of Blue Prints for Estimates.

Machine Wrenches
Screw Drivers
Pliers
Structural Wrenches
Track "
Eye Bolts
Lathe Dogs
Etc.



Canadian Billings & Spencer, Limited **Welland, Ont.**

ARMSTRONG

DROP FORGED STEEL LATHE DOGS



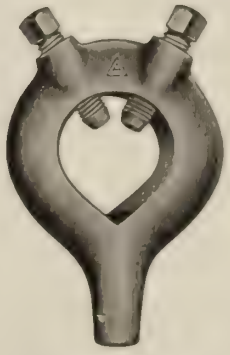
All Kinds
All Sizes
3-8 in. to 8 in.

POINTS OF EXCELLENCE

Uniformity of design.

Tool steel set screws with our improved beveled point which prevents upsetting.

No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.



HEAVY DUTY DOG

Write for Special Circular and Discounts.

Have Armstrong Quality

Best Obtainable in Design, Workmanship and Material

If you Want the BEST Specify ARMSTRONG Drop Forged Dogs



Armstrong Bros. Tool Co., "The Tool Holder People" 106 N. FRANCISCO AVE., CHICAGO, U. S. A.

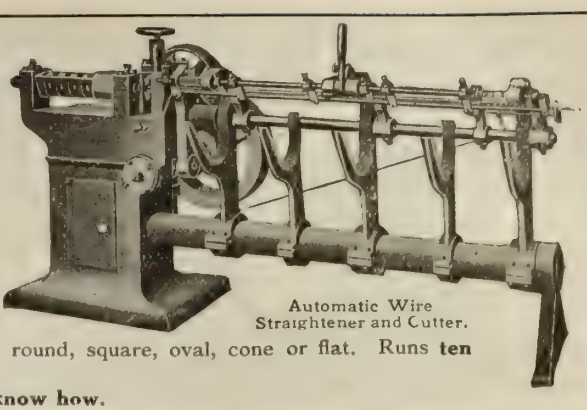


Elastic Rotary Blow Riveter

BUILT TO WEAR

Our Automatic Wire Straighteners and Cutters, every pound of weight **distributed** so as to secure the **greatest efficiency** and **longest wear.**

Makes the wire **perfectly straight,** and **cuts accurate lengths,** rough stock or gold plated, ¾" diameter and smaller.



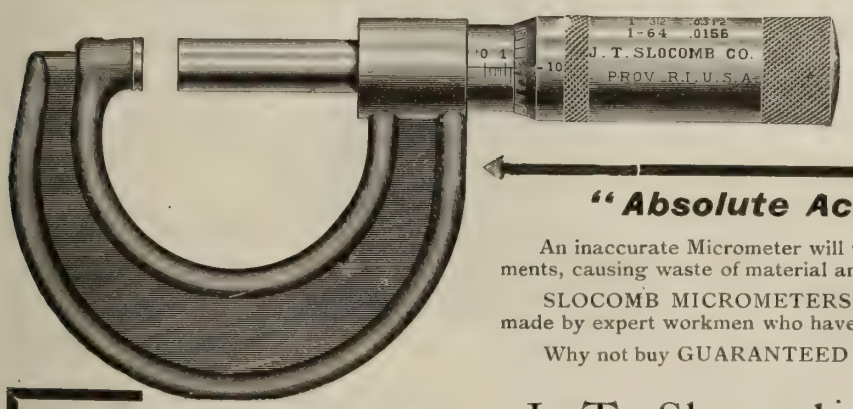
Automatic Wire Straightener and Cutter.

Our ELASTIC ROTARY BLOW RIVETING MACHINE forms a head as **quick as a flash,** every head nicely finished, round, square, oval, cone or flat. Runs **ten hours a day,** every day in the year.

Half a century building this Machinery proves that **we know how.**

THE F. B. SHUSTER CO., *Established 1866* ***New Haven, Conn.***

Straighteners and Cutters for squares, flats, hexagons and irregular shapes. Cotter Pin Machines, Buckle Tongue Machines, Staple Machines of all kinds. Special Automatic Machinery.



"Slocomb" Micrometers

"Absolute Accuracy" Saves Money.

An inaccurate Micrometer will waste many times its own cost by inexact measurements, causing waste of material and time.

SLOCOMB MICROMETERS are guaranteed to be absolutely accurate, being made by expert workmen who have made them exclusively for many years.

Why not buy GUARANTEED ACCURACY and save trouble in your shops?

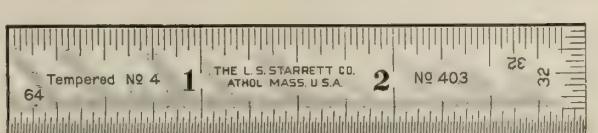
Write for our catalog 12C and Measuring Book C. Every Machinist should have one.

J. T. Slocomb Co., Providence, R.I., U.S.A.

STARRETT TOOLS

ARE THE STANDARD FOR ACCURACY, WORKMANSHIP, DESIGN AND FINISH

THE ACME OF RULE PERFECTION



Spring Tempered Rules with heavy figures, graduated end and beveled edge. Made in 2, 3, 4, 6, 9, 12, 18 and 24-in sizes.

No. 403, No. 4 grad., with 64th's on the beveled edge, and graduated in 32nd's on opposite sides of one end.

No. 404, No. 4 grad., with 64th's on the beveled edge, and graduated in 32nd's on one side and 48th's on the other side of the same end.

These rules are the most advanced product of the rule maker's art. They are sold at the same price as ordinary spring tempered rules.

Send for Free Catalogue, No. 173, of Fine Mechanical Tools

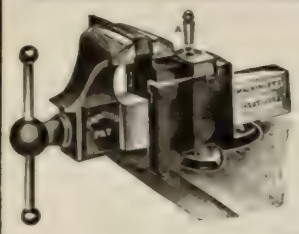
THE L. S. STARRETT CO.

ATHOL, MASS., U.S.A.



HINTS TO BUYERS

Do Not Be Misled by Inferior Imitations.



There is but one

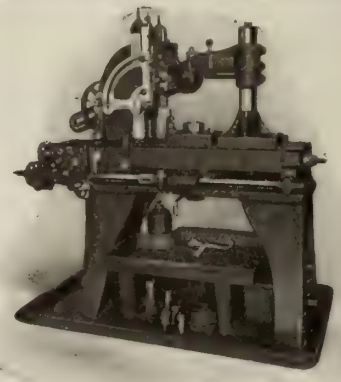
PRENTISS VISE

Made by

Prentiss Vise Company

Hardware Building, 106-110 Lafayette St., Cor. Walker St., NEW YORK

Canadian Agents: A. McFarland & Co., Coristine Bldg., Montreal



The Whiton

AUTOMATIC

Gear Cutting Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.



ROCKWELL

ROD HEATING

FURNACES

¶ For upsetting, cutting off, coiling, etc. Will take stock from ⅜ to 4 in. diam

¶ Made in Standard Sizes.

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W. S. Rockwell Company

50 Church St. :: :: NEW YORK

(Hudson Terminal Bldg.)

(The Original Furnace Rockwell)

NORTON JACKS

Standard on the Leading Railroads

Made in Canada.

Stock carried for **immediate shipment.**



Manufactured only by

A. O. NORTON,

COATICOOK,

Prov. QUEBEC.

STOCK CARRIED BY

MUSSENS LIMITED, - Montreal and Winnipeg

H & E PATENT BALL BEARING LIFTING JACKS

for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.



Made in plain and foot lift styles, fully guaranteed.

Manufactured by

H & E Lifting Jack Company

WATERVILLE, QUE.

Stock carried by F. H. HOPKINS & CO. Montreal

CUT GEARS

THEORETICALLY CORRECT

IN

RAWHIDE OR METAL

ROBERT GARDNER & SON LTD

Nazareth St. — MONTREAL

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Thor

PISTON AIR DRILLS



Sold in Canada by
H. W. PETRIE, Limited
Toronto
Montreal
Vancouver

The Drill with CORLISS VALVE MOTION
30% greater efficiency guaranteed.

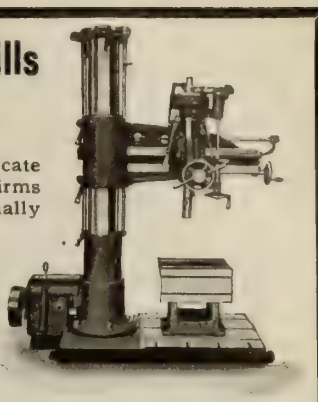
Independent Pneumatic Tool Company
Chicago New York Pittsburg San Francisco

Mueller Radial Drills

Are made for Hard and Constant Work

This has been proven by duplicate orders received from large firms who keep the machines continually in use.

You can have a circular for the asking.

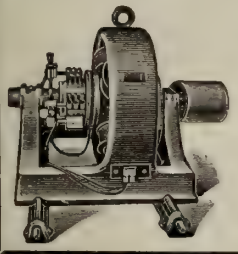


The Mueller Machine Tool Company
CINCINNATI, OHIO

Agents: The General Supply Co., of Canada, Ltd., Toronto, Winnipeg, Ottawa. Hallman, Penisten Machinery Co., Vancouver, B.C. The Foss & Hill Machinery Co., Montreal, Que.

YOU NEED MORE LIGHT
IN YOUR FACTORY. WRITE

TORONTO & HAMILTON ELECTRIC CO.



MANUFACTURERS OF
Dynamos
for Light and Power
AND ALL
ELECTRICAL APPARATUS



The Union Drill Chuck

has many points to recommend it. It is an accurate Chuck and all parts are strong and durable. The Jaws and Screw are made of a high grade tool steel, and are made to give long wear. In addition, the Chuck is provided with a positive drive feature, which, if properly used, will add to the life of the Chuck, and save wear of the drills. Made in seven sizes, with capacity up to 2 inch drills.

Union Manufacturing Co.

26 Cortlandt Street, New York NEW BRITAIN, Conn., U.S.A.
MAKERS OF A COMPLETE LINE OF CHUCKS.



GRONKVIST

The most remarkable Chuck ever put on the market.

Drills can be changed instantly while running 1000 revolutions or more easier than when not running.

No Slipping, Perfect Centering, Long Life. No Equal for Jig Work.

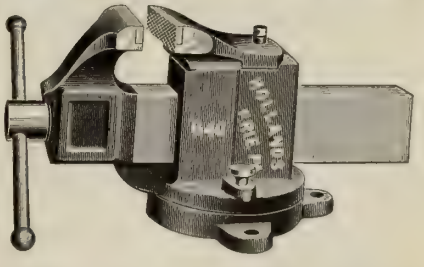
SOLE CANADIAN AGENTS:
The Stevens Co. of Galt, Limited
GALT ONTARIO

HOLLANDS VISES

have been used exclusively for a quarter of a century by many leading industrial and railway shops in Canada and U.S.A

Each style is adapted perfectly to its particular work.

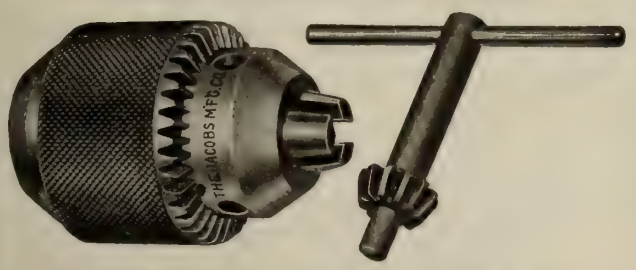
Catalog Sent on Request.



Filers' Vise with Swivel Base and Jaw

Hollands Mfg. Co. - - Erie, Pa.

REMARKABLE SUCCESS

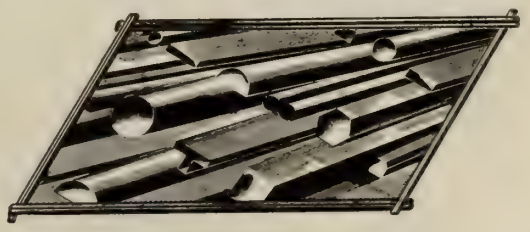


Our remarkable success in the sale of more than 105,500 Jacobs Improved Drill Chucks, is accounted for because of the following reasons: 1. The unique appearance of the Jacobs Improved Drill Chuck resulted in its being tested. 2. A test demonstrated its convenience, efficiency and accuracy. 3. Continued use has proven its durability Every part of the Jacobs Chuck is fully guaranteed.

Our thirty-four page illustrated catalogue sent upon request.

The Jacobs Manufacturing Company, - Hartford, Conn.

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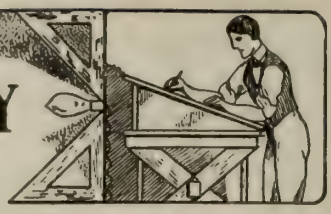
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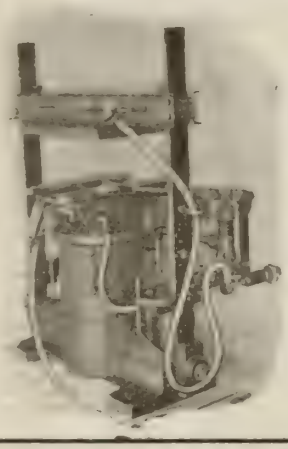
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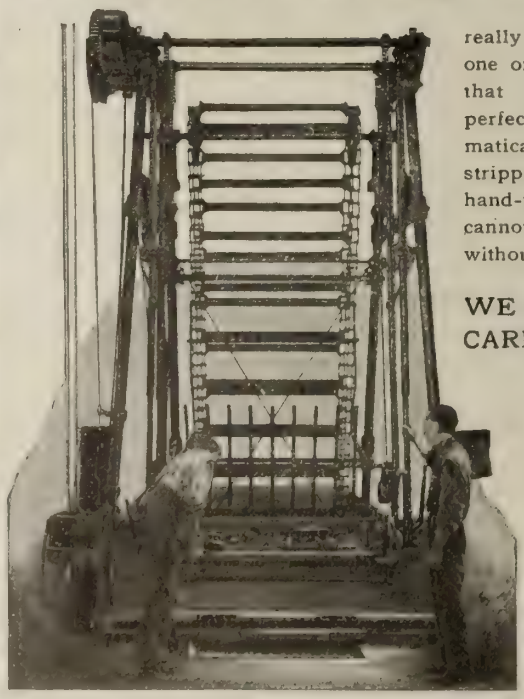
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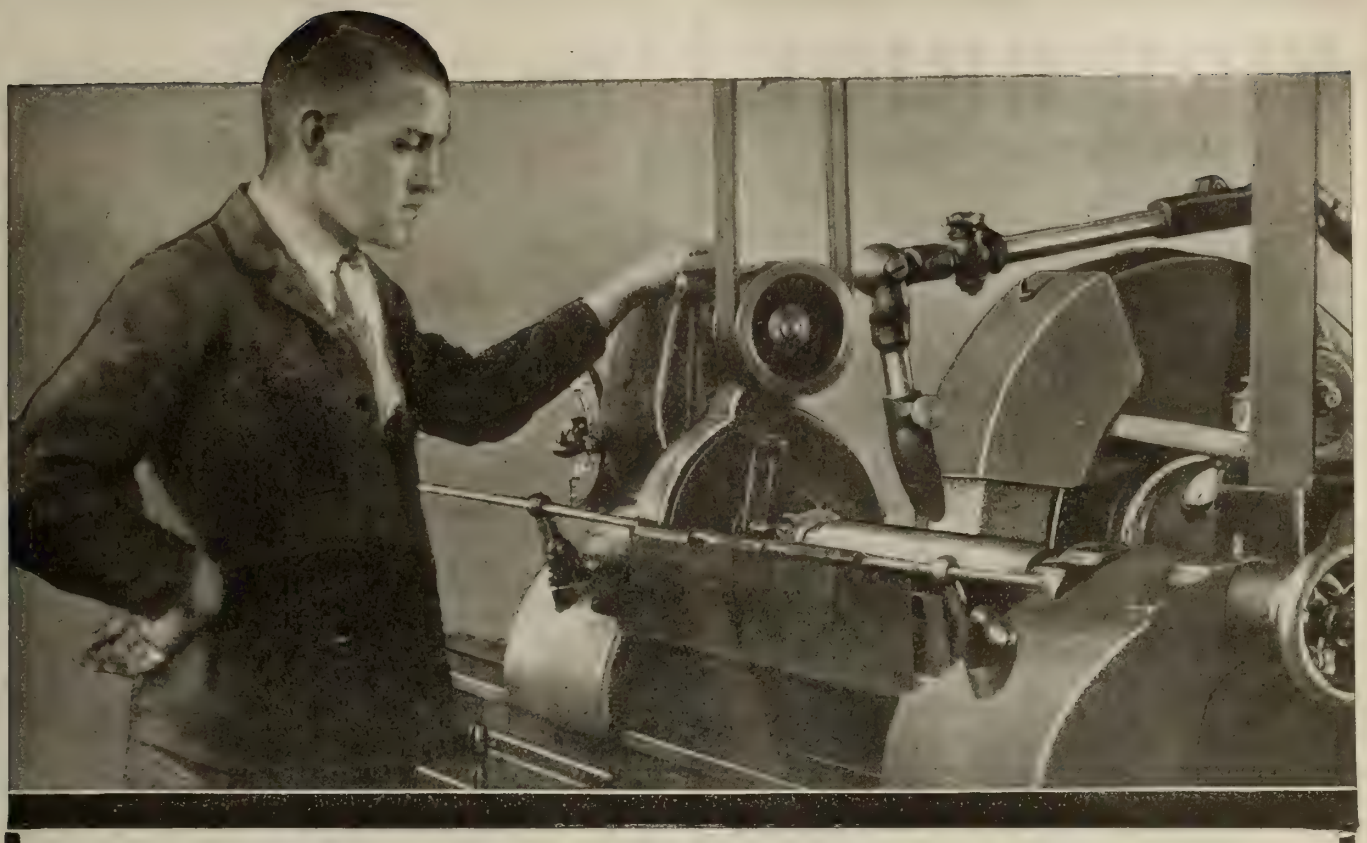
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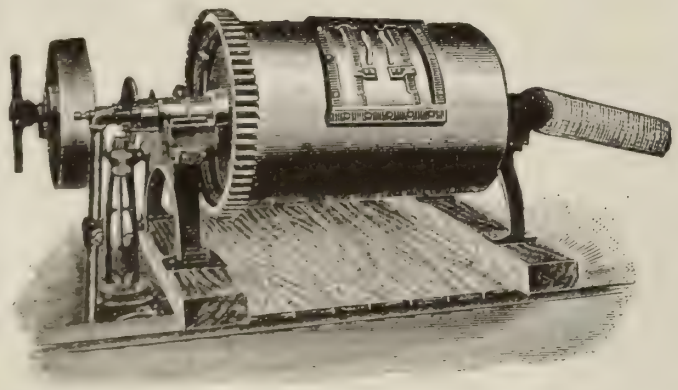
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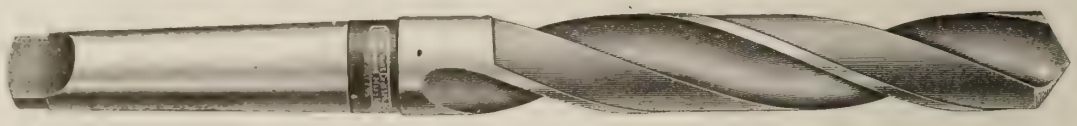
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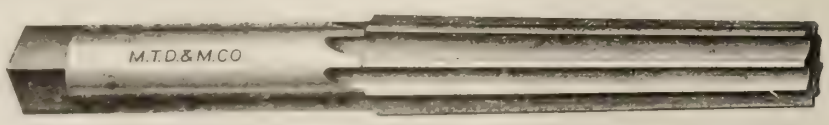


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T. & H. Electric Co., Hamilton

Electric Welding.
Standard Welding Co., Cleveland, O.

Elevators and Buckets.
Francis Hyde & Co., Montreal.
Waterous Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill

Emery Grinders (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland

Emery and Emery Wheels.
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton.
Garvin Machine Co., New York
Foss & Hill Machinery Co., Montreal
Francis Hyde & Co., Montreal
Mussens, Limited, Montreal
Pittsburg Emery Wheel Co., Pittsburg Pa
Stevens, F. B., Detroit, Mich.

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Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Gardner, Robt. & Son, Montreal
Francis Hyde & Co., Montreal.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton

Engineers, Marine and Mechanical.
Canadian General & Shoe Machinery Co. Levis, Que.

Engines, Marine.
The "Swift" Motor Car Co. of Canada Ltd., Chatham

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Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.
The Canadian Fairbanks Co., Montreal
Fielding & Platt Ltd., Gloucester, Eng.
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
National Mach. & Supply Co., Hamilton
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engines, Steam.
General Supply Co. of Canada, Ottawa
The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst N.S.
National Mach. & Supply Co., Hamilton
Scotia Eng. Co., Montreal
Sheldons Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Equipment, Shop
Garvin Machine Co., New York

Escutcheon Pins.
Parmenter & Bulloch Co. Gananoque

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Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Expanded Metal.
Steel & Radiation Ltd., Toronto

Fans, Electric.
Canadian Westinghouse Co., Hamilton
Foss & Hill Machinery Co., Montreal
Matthews & Yates, Manchester Eng.
Sheldons Limited Galt, Ont.
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.
The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
General Supply Co. of Canada, Ottawa
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford.

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General Supply Co. of Canada, Ottawa
Nicholson File Co., Port Hope, Ont.
Simonds Mfg. Co., Fitchburg, Mass.

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Dart Union Co., Ltd., Toronto

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Independen Pneumatic Tool Co. Chicago, Ill.
National Mach. & Supply Co., Hamilton
W. S. Rockwell Co., New York
Sheldons Limited, Galt, Ont.

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Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York

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Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.

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John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co., Toronto

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Waterous Engine Works Co., Brantford.

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Canadian Steel Foundries, Montreal

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Standard Engineering Co., Toronto
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Sheldons Limited, Galt.

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Harbison-Walker Refractories Co., Pittsburg

Gas Producer Plants.
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Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn

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Garvin Machine Co., New York
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Morse Twist Drill and Machine Co., New Bedford
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

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"PARADOX" ADJUSTABLE REAMERS

are the only adjustable reamers that have all the rigidity and accuracy of a solid tool.

"Paradox" Reamers Mean a Great Saving in Tool Expense

Consider the waste you have been subject to for years by throwing away solid reamers when the cutting edges were worn below size.

It's different with the "Paradox." They can be adjusted repeatedly to standard size until the blades are used up; then all that's necessary is a new set of blades—the body is still as good as ever.



The **"Paradox"**

Stands Unrivaled Among Adjustable Reamers in—

1st. ACCURACY. When adjusted, the blades remain absolutely parallel, insuring straight, true holes.

2nd. SOLIDITY. The blades are held securely in place, wedged in and down against the back and bottom of their grooves by special taper headed screws.

3rd. SERVICE. One "Paradox" Reamer will outlive eight or ten solid reamers before the first set of blades is worn out.

Catalog No. 33-C gives full information and list prices.

The CLEVELAND Twist Drill Co.

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New Process Raw Hide Co., Syracuse
Waterous Engine Works Co., Brantford

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Hall Engineering Works, Montreal
Lancashire Dynamo and Motor Co., Ltd., Toronto
Toronto & Hamilton Electric Co., Hamilton

Grates, Shaking and Dumping.

Standard Engineering Co., Toronto

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Joseph Dixon Crucible Co., Jersey City
Detroit Foundry Supply Co., Windsor
Francis Hyde & Co., Montreal
John Millen & Son, Montreal
Stevens J. B., Detroit, Mich

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Peterboro Lubricator Mfg. Co., Peterboro

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W. H. Banfield & Sons, Toronto
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Canadian Hart Wheels Ltd., Hamilton
Cincinnati Pneumatic Tool Co., Cleveland
Geo. Mfg. Co., Pittsburg, Pa.
General Supply Co. of Canada, Ottawa
Niles-Bement-Pond Co., New York
United States Expt. Tool Co., Cincinnati
Morse Twist Drill and Machine Co., New Bedford

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Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York
Stevens Co., Galt, Ont

Grinders, Disc.

Armstrong Bros., Chicago
Bath Grinder Co., Fitchburg, Mass
Mussens, Limited, Montreal
Valley City Machine Works, Grand Rapids

Grinders, Drill.

Garvin Machine Co., New York
Mussens, Limited, Montreal

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Cleveland Pneumatic Tool Co., Cleveland

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Mussens, Limited, Montreal
United States Expt. Tool Co., Cincinnati

Grinders, Tool and Holders.

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Blount, J. G. & Co., Everett, Mass

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Canadian Hart Wheels Ltd., Hamilton
Dominion Abrasive Wheel Co., Toronto
Gardner Robt. & Son, Montreal
Garvin Machine Co., New York
Geo. Mfg. Co., Pittsburg, Pa
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Pittsburg Emery Wheel Co., Pittsburg, Pa

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Canadian Hart Wheels Ltd., Hamilton
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Mussens Limited, Montreal

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Long & Alstatter Co., Hamilton
London Mach. Tool Co., Hamilton, Ont.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York

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Independent Pneumatic Tool Co., Chicago
Canadian Rand Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
Mussens, Limited, Montreal

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John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton, Ont
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton
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Whitney Foundry Equipment Co., Harvey, Ill
Mussens, Limited, Montreal

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Fay, C. A. & Egan Co., Cincinnati
Foss & Hill Machinery Co., Montreal
Gardner Robt. & Son, Montreal
The Goldie & McCulloch Co., Galt
Owen Sound Iron Works Co., Owen Sound
Positive Clutch & Pulley Works, Toronto
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford

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Darling Bros., Ltd., Montreal
Sheldons Limited, Galt.
Steel & Radiation, Toronto

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Mussens, Limited, Montreal
Schuchardt & Schutte, New York

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Advance Machine Works Ltd., Walkerville, Ont
John Millen & Son, Limited, Montreal
Mussens, Limited, Montreal
Northern Eng. Works, Detroit

Hose Clamp Tool.

Cleveland Pneumatic Tool Co., Cleveland

Hose, Pneumatic.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago

Hydraulic Accumulators.

The Canadian Fairbanks Co., Montreal
Mussens, Limited, Montreal
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

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Fielding & Platt, Ltd., Gloucester, Eng.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.
Schuchardt & Schutte, New York

Index Centres.

Garvin Machine Co., New York

Interlocking Plants and Signals.

Canadian Steel Foundries, Montreal

Intersections, Railway.

Canadian Steel Foundries, Montreal

Iron Filler.

Imperial Waste & Metal Co., Montreal

Jacks.

The Canadian Fairbanks Co., Montreal
Canadian Steel Foundries, Montreal
General Supply Co. of Canada, Ottawa
Francis Hyde & Co., Montreal
H & B Lifting Jack Co., Waterville, Que.
Mussens, Limited, Montreal
Norton, A. O., Coaticook, Que.

Jacks, Compressed Air.

Canadian Rand Co., Montreal

Jacks, Pit and Track.

The Canadian Fairbanks Co., Montreal
Canadian Steel Foundries, Montreal

Jaws, Face Plate.

Cushman Chuck Co., Hartford, Conn.
S. E. Heaton Machine Co., Windsor Locks, Conn.

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Mussens, Limited, Montreal

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Canadian Westinghouse Co., Hamilton

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Pratt & Whitney Co., Hartford, Conn.

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Hardinge Bros., Inc., Chicago
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Foss & Hill Machinery Co., Montreal
Gardner, Robt. & Son, Montreal
Garvin Machine Co., New York
The Canadian Fairbanks Co., Montreal
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D. McKenzie, Guelph, Ont.
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Stevens Co., Galt, Ont.
Von Wyck Machine Tool Co., Cincinnati

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Fay & Scott, Dexter, Maine
Mussens, Limited, Montreal

Lathes, Screw Cutting.

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Miami Valley Mach. Tool Co., Dayton, O
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Schuchardt & Schutte, New York
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Cincinnati Lathe & Tool Co., Cinn., O
Garvin Machine Co., New York
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Mussens, Limited, Montreal.
Niles-Bement-Pond Co., New York.
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Stevens Co., Galt, Ont.
Warner & Swasey Co., Cleveland, O.

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Jones & Glassco, Montreal
John Millen & Son, Limited, Montreal
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Canadian Westinghouse Co., Hamilton

Locomotives, Industrial.

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Mussens, Limited, Montreal

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General Supply Co. of Canada, Ottawa
Francis Hyde & Co., Montreal.
John Millen & Son, Montreal

Machine Divided Rules.

Lufkin Rule Co., Saginaw, Mich.

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Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
The Smart-Turner Machine Co., Hamilton
Schuchardt & Schutte, New York

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B. Greening Wire Co., Hamilton

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Lufkin Rule Co., Saginaw, Mich.

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Schuchardt & Schutte, New York

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Standard Engineering Co., Toronto

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John Millen & Son, Montreal
Morse Twist Drill and Machine Co., New Bedford
The Pratt & Whitney Co., Hartford, Conn
Standard Tool Co., Cleveland, O

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Waterous Engine Works Co., Brantford.

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Canadian Westinghouse Co., Hamilton

Mill Machinery.

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Robb Engineering Co., Amherst, N.S.
Waterous Engine Co., Brantford.

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John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York,
Pratt & Whitney, Hartford, Conn.

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Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
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Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

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Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

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Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal.
Garvin Machine Co., New York
Schuchardt & Schutte, New York

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Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O

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Mussens, Limited, Montreal

Mining Machinery.

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Canadian Rand Co., Montreal.
General Supply Co. of Canada, Ottawa
Mussens, Limited, Montreal
T. & H. Electric Co. Hamilton.
Waterous Engine Works Co., Brantford

Mortising Machines.

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Motors, Electric.

The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

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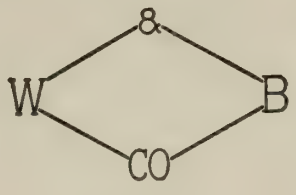
"W & B-DIAMOND"

Twist Drills do and we ***guarantee*** them to be of ***highest quality*** and ***accurate to size.***

We make them from Carbon Steel and Vanadium High Speed Steel and carry the largest stock in Canada.

The "Hercules" High Speed Twist Drill shown on this page is one of our many types and is ***twisted*** while hot from Vanadium High Speed Steel.

Write for Catalog No. 74



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Steel & Radiator, Toronto

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Armstrong Tool Bros. Co., Chicago

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John Bertram & Sons Co., Dundas, Ont.
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Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton, Ont.
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Waterous Engine Works Co., Brantford

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Niles-Bement-Pond Co., New York.
United Engineering & Foundry Co., Pittsburg

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Waterous Engine Works Co., Brantford.

Pulleys.

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The Goldie & McCulloch Co., Galt.
John Millen & Son, Limited, Montreal
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Owen Sound Iron Works Co., Owen Sound
Positive Clutch & Pulley Works, Toronto
Schuchardt & Schutte, New York
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

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Darling Bros., Ltd., Montreal
Standard Engineering Co., Toronto.

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Canadian Rand Co., Montreal
Darling Bros., Ltd., Montreal
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal, Que.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal
National Mach. & Supply Co., Hamilton
The Smart-Turner Mach. Co., Hamilton

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London Mach. Tool Co., Hamilton, Ont.
Mussens, Limited, Montreal
Pratt & Whitney Co., Hartford, Conn.
Ramsay, Maynard Co., St. Catharines, Ont.
Schuchardt & Schutte, New York

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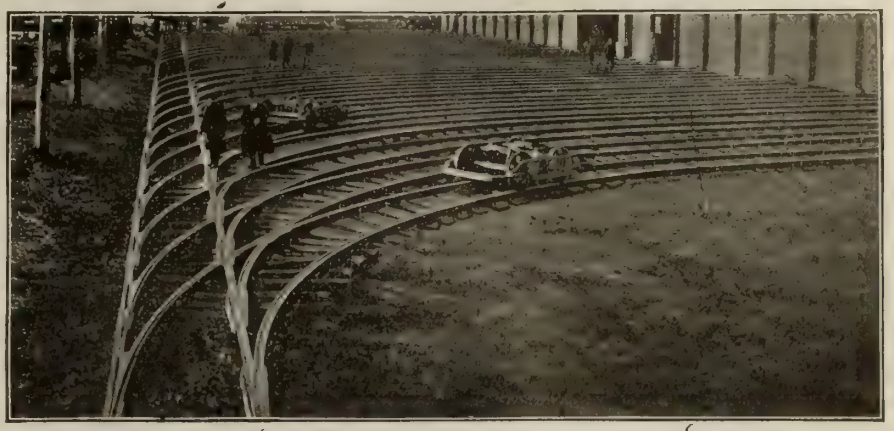
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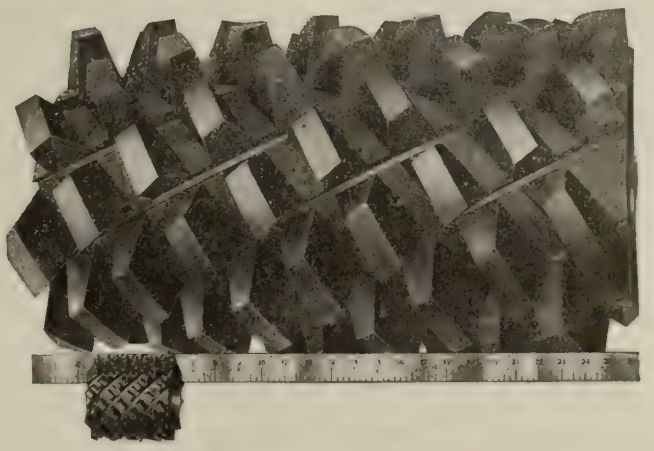
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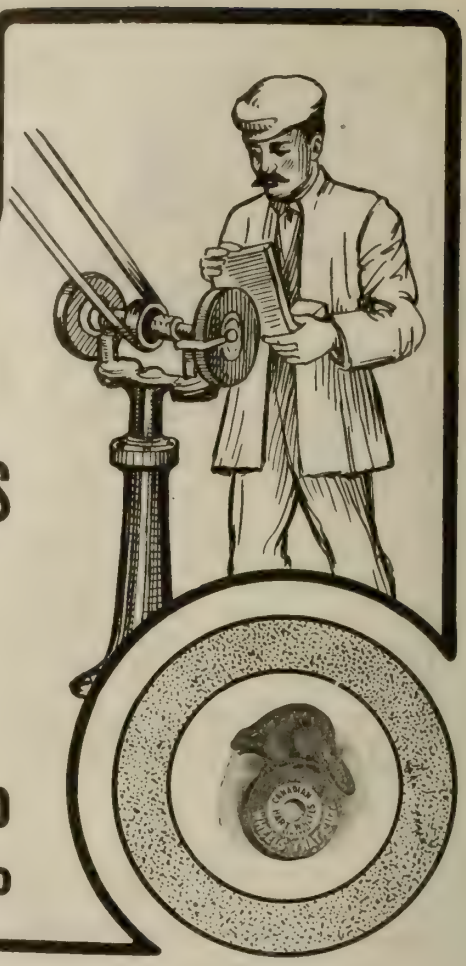
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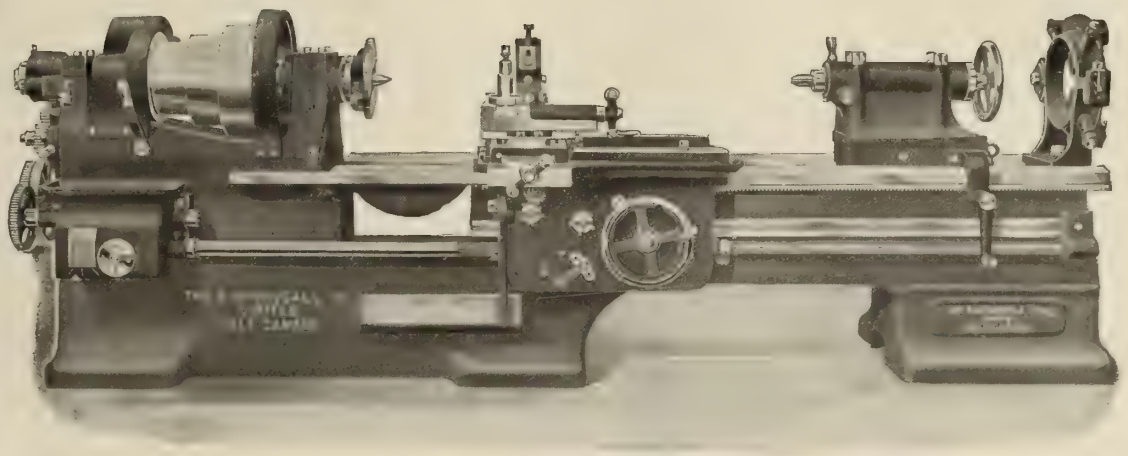
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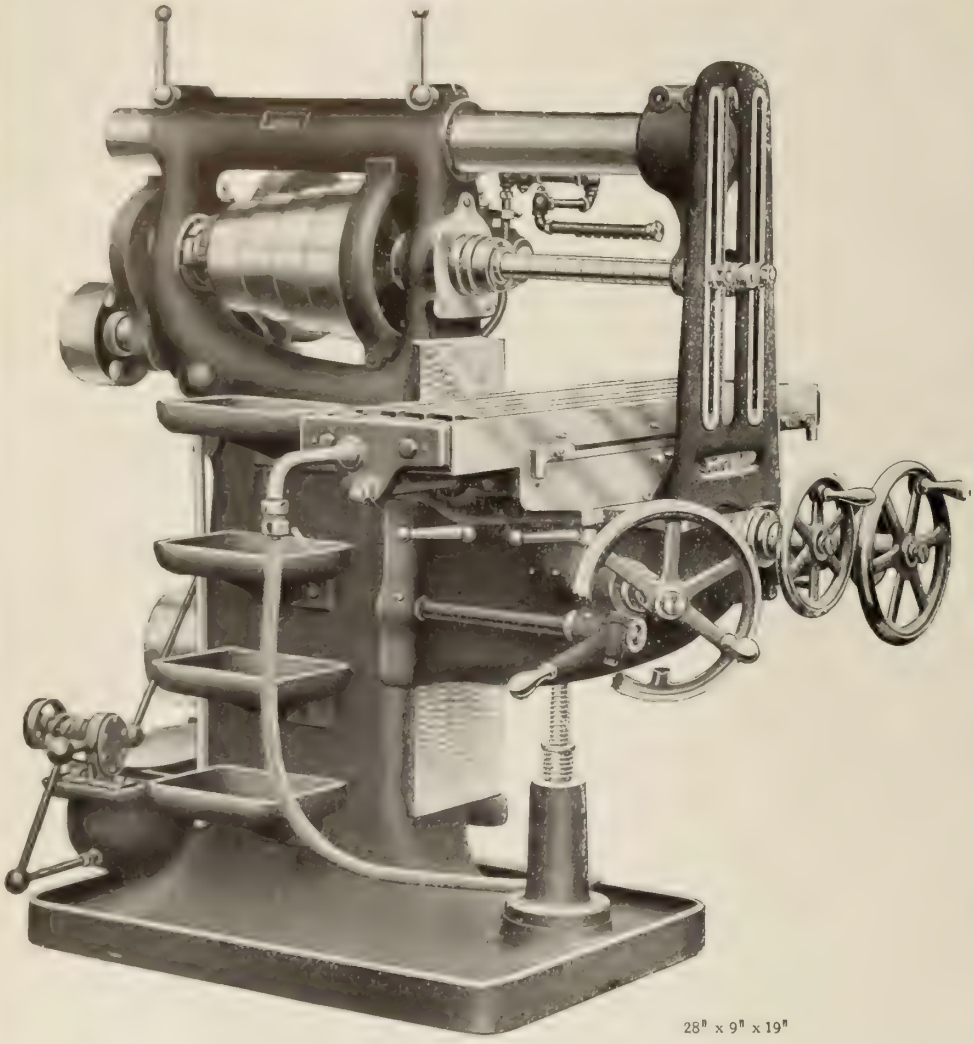
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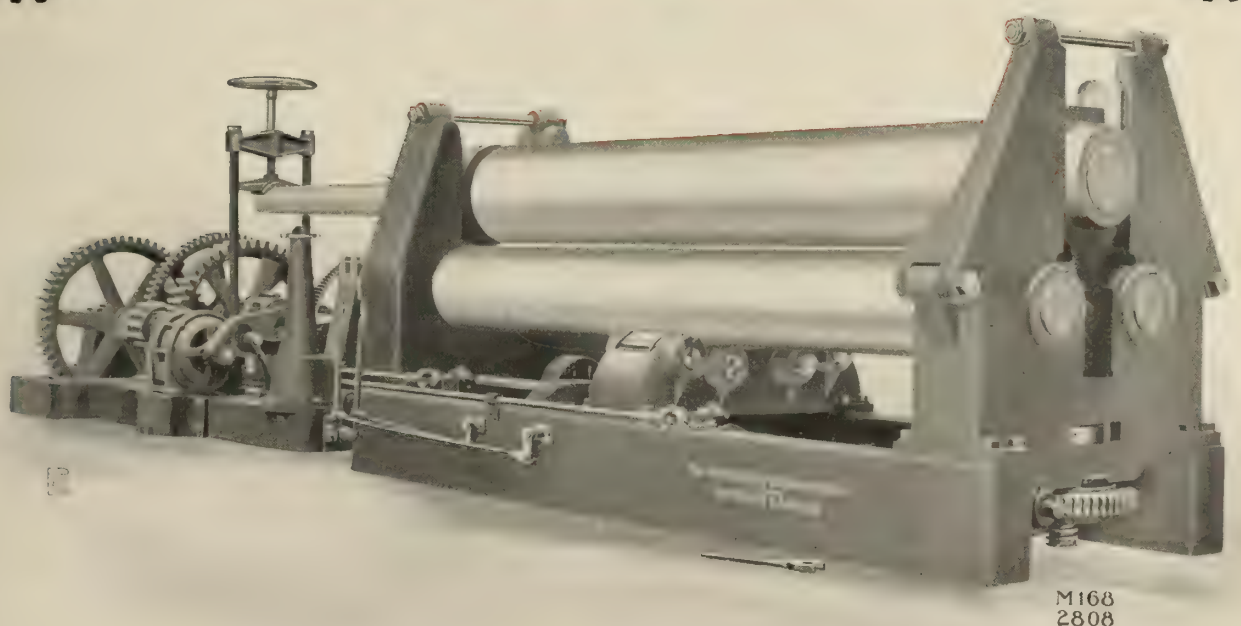
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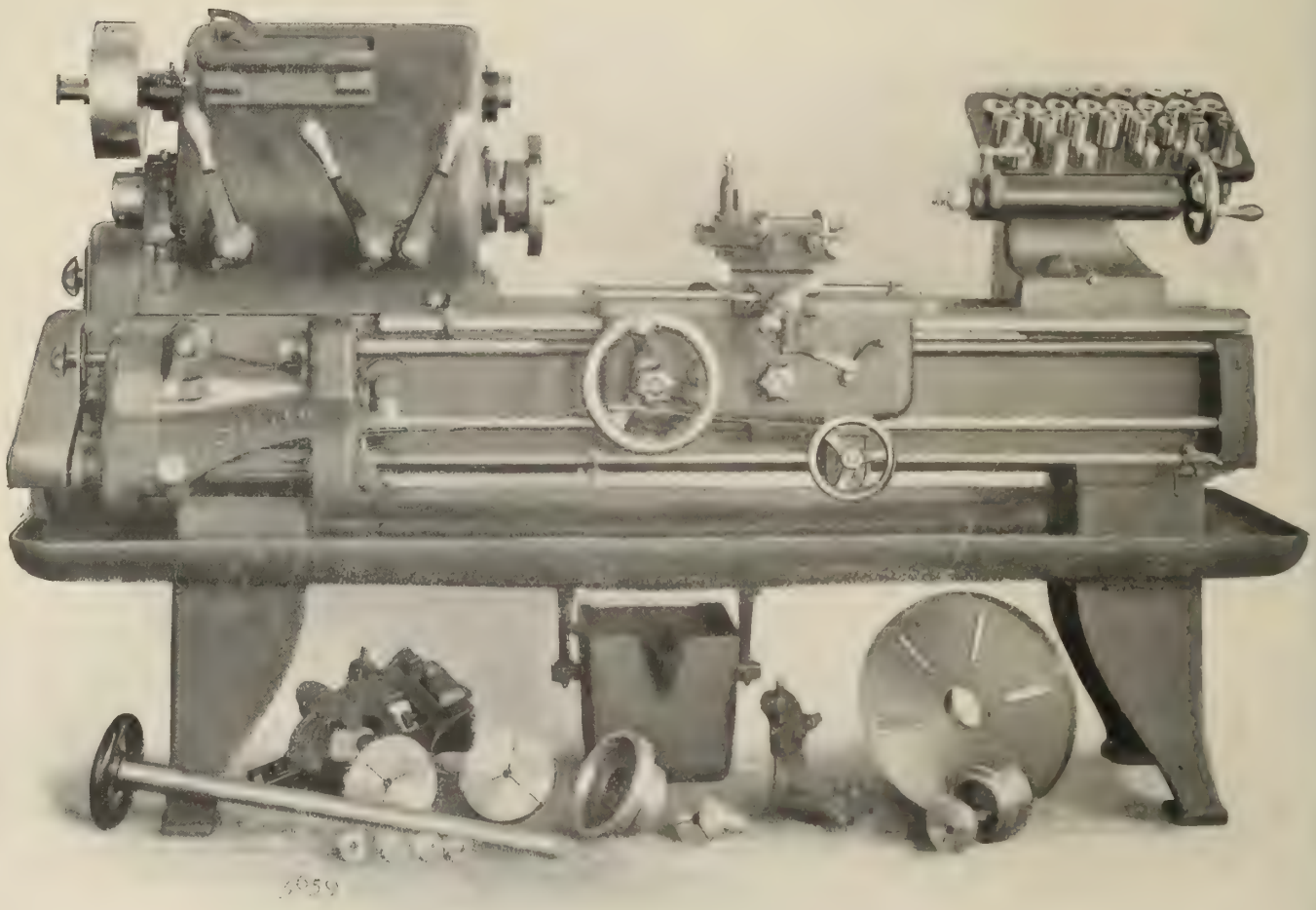
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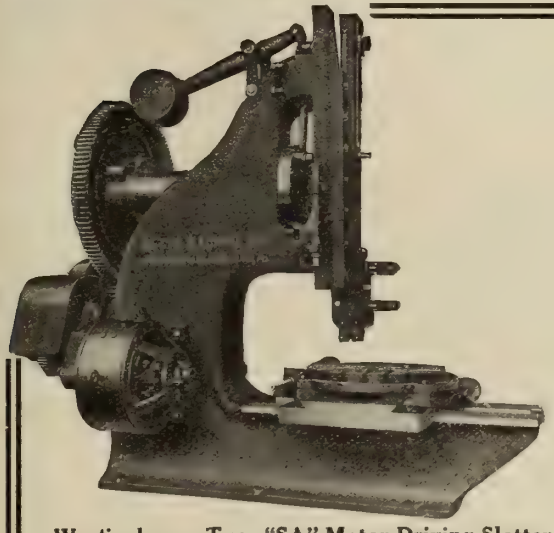
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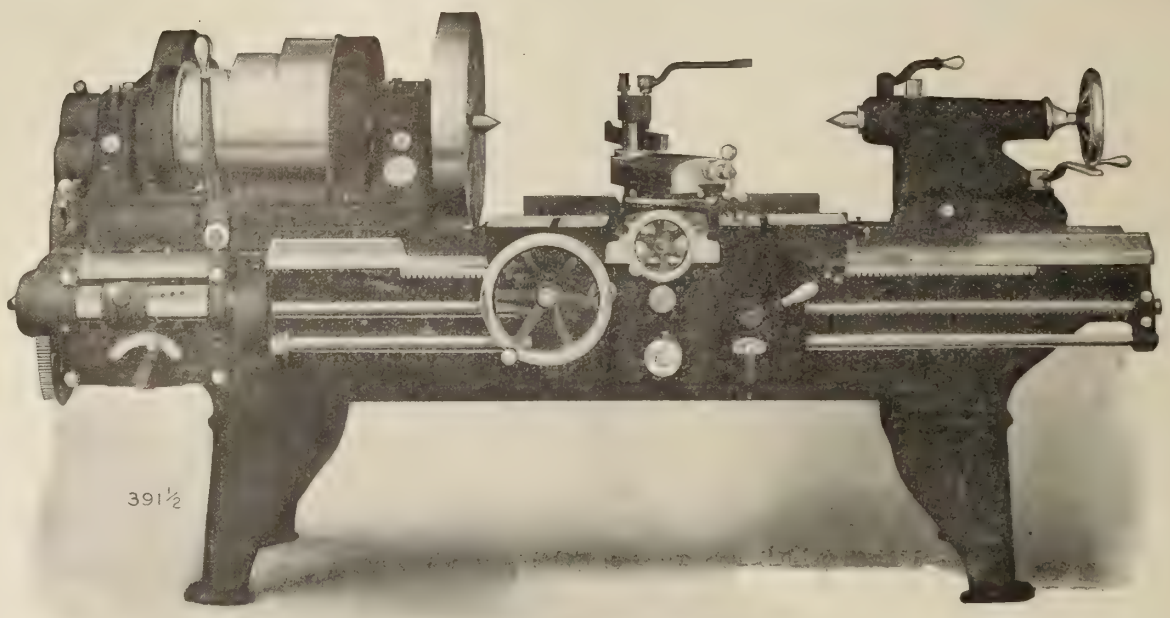


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A patent "oompensating V" that permits four times the bearing area between the carriage and bed found on other lathes.

A carriage in which the tool thrust is taken on a bearing the entire length of the carriage, and which positively will not climb the V.

A double-walled one-piece apron which will last as long as the rest of the lathe.

A quick change gear complete in one unit, giving thirty-six changes with two operating levers.

An offset compound rest which can be used without skinning the operator's knuckles.

The centres set back of the middle of the bed, giving greater swing over carriage and permitting the turning of work up to the maximum swing without the tool overhanging the bed.

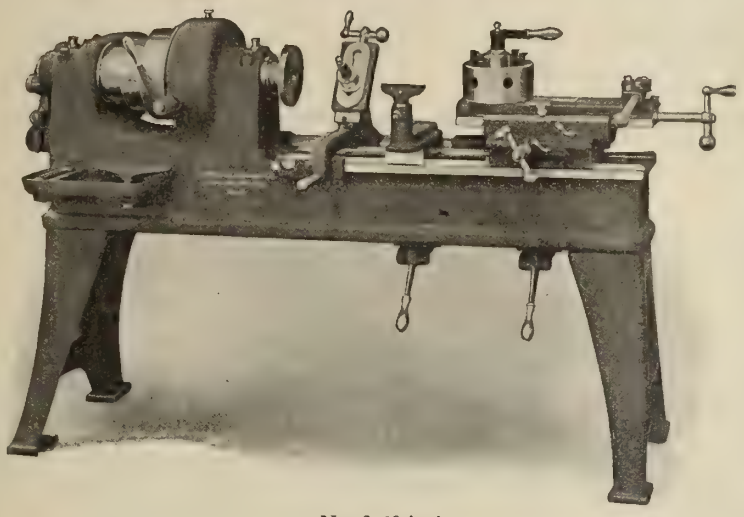
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The London Machine Tool Co., Limited

HAMILTON, CANADA

Eastern Agents: Rudel-Yeates Machinery Co., 610 Canadian Express Building, Montreal, Que.

UNIVERSAL TURRET LATHES



No. 3, 18 inch

Universal Turret Lathes. Three sizes—16 in. 18 in., and 24 in.

These are excellent machines for general use, and for jobbing and repair work. They are rigidly constructed and the design and detail have been worked out to satisfy the most critical user.

They are adapted for a great variety of work, and large and small lots, and are capable of handling it rapidly.

Send samples or blue prints and let our Engineering Department estimate on the output.

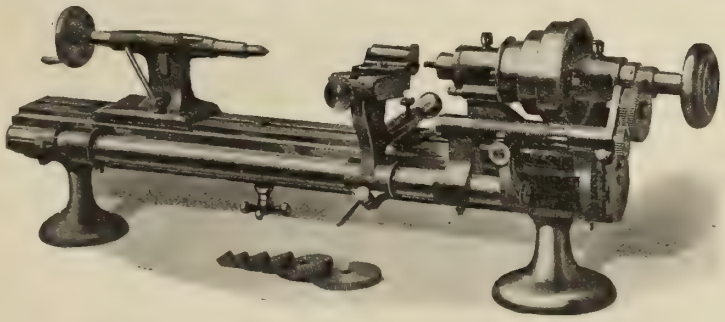
Hollow Hexagon Turret Lathes. Turret Screw Machines. Brass-working Machine Tools.

THE WARNER & SWASEY COMPANY

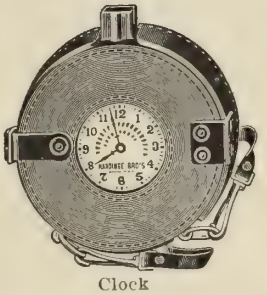
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Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams and Wilson, Montreal

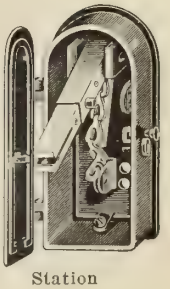
THE HARDINGE LINE



Hardinge No. 3 Bench Lathe, showing Chasing Attachment.

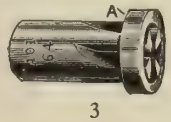


Clock

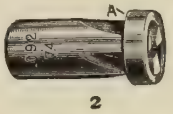


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Beyer Watchman's Clock for Factories, Lumber Yards or Town Patrol.



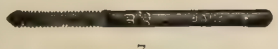
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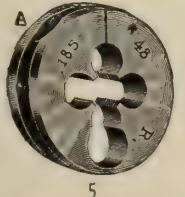


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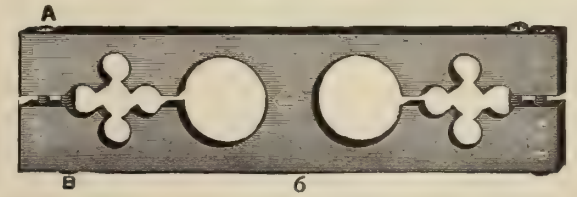
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8



5



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4

Taps and Dies of special sizes, English or Metric Pitches.

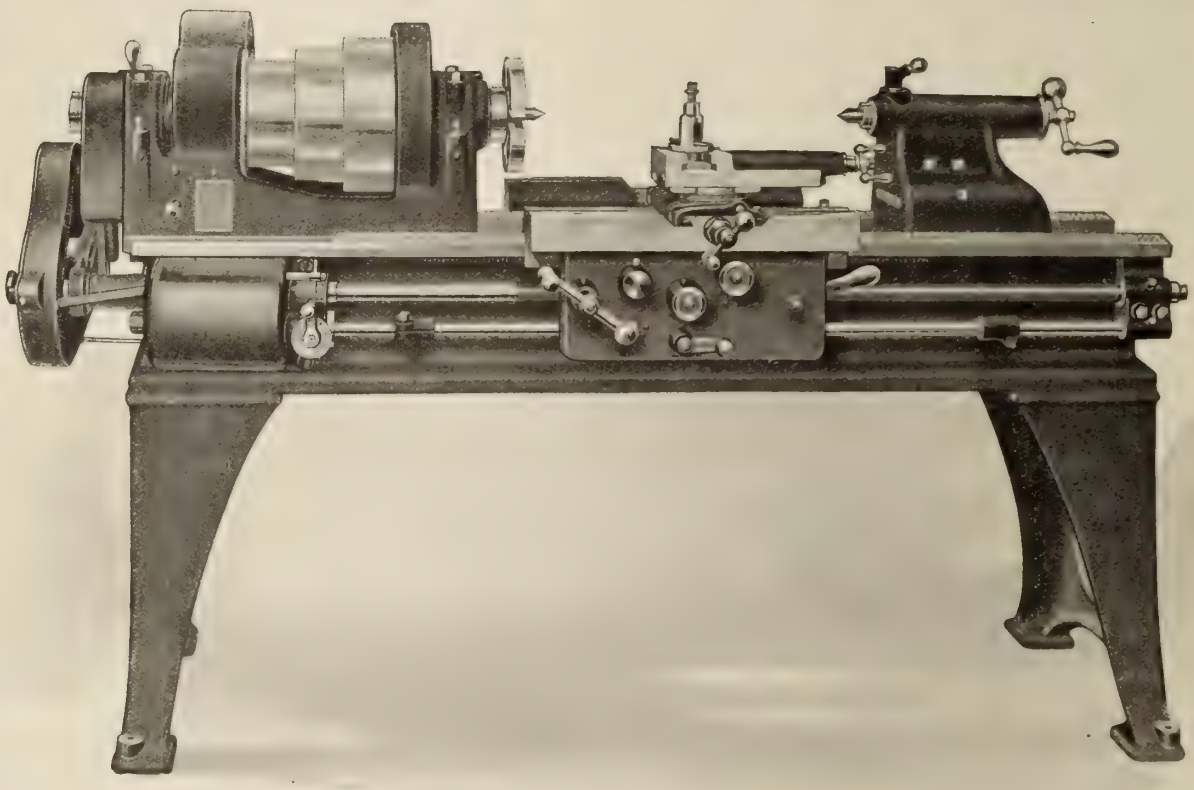
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16 in. Lathe, with 3-Step Cone, Double Back Gears.

14 in. to 42 in. ENGINE LATHES.

LATHES with 5-STEP HEAD, FRICTION HEAD, 3-STEP CONE and DOUBLE BACK GEARS, SINGLE PULLEY DRIVE and MOTOR DRIVE.

12 in., 15 in. and 20 in. CRANK SHAPERS.

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We Invite your INQUIRIES.

The Springfield Machine Tool Co.

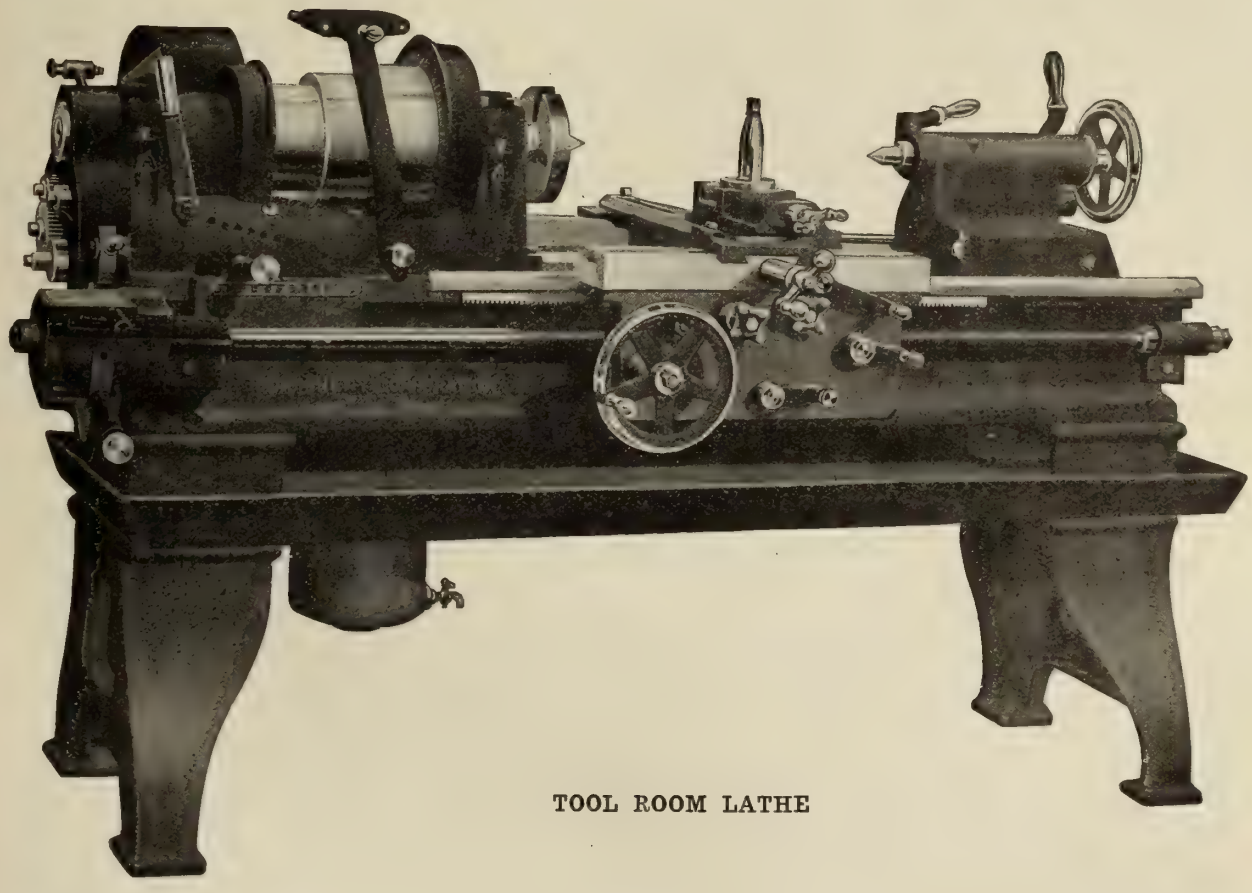
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Lathes, Shapers, Planers, Slotters, Punches, Shears

Latest Designs, Finest Workmanship



TOOL ROOM LATHE

Note the appearance of this machine. Hundreds of them in use, and every one giving satisfaction. One grade only and that the best.

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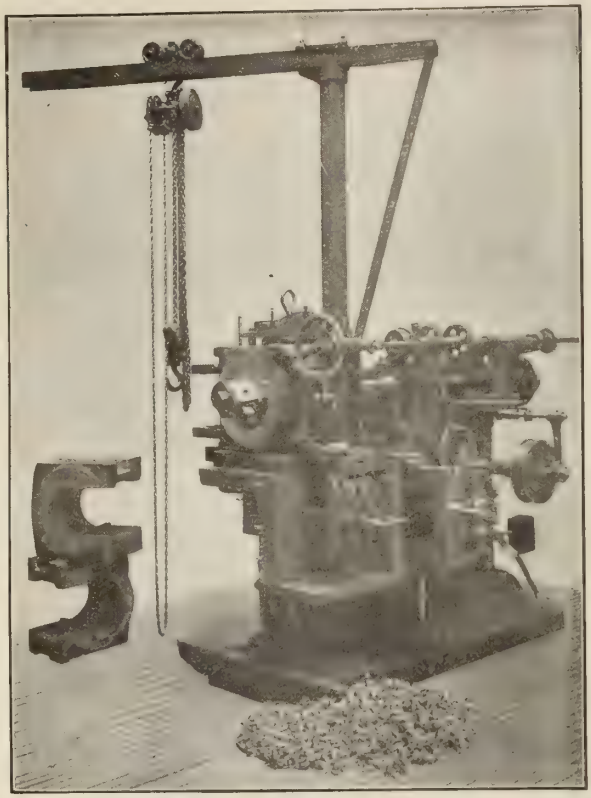
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Canada Machinery Corporation, Limited

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Don't fail to mention "Canadian Machinery" in writing to advertisers.

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

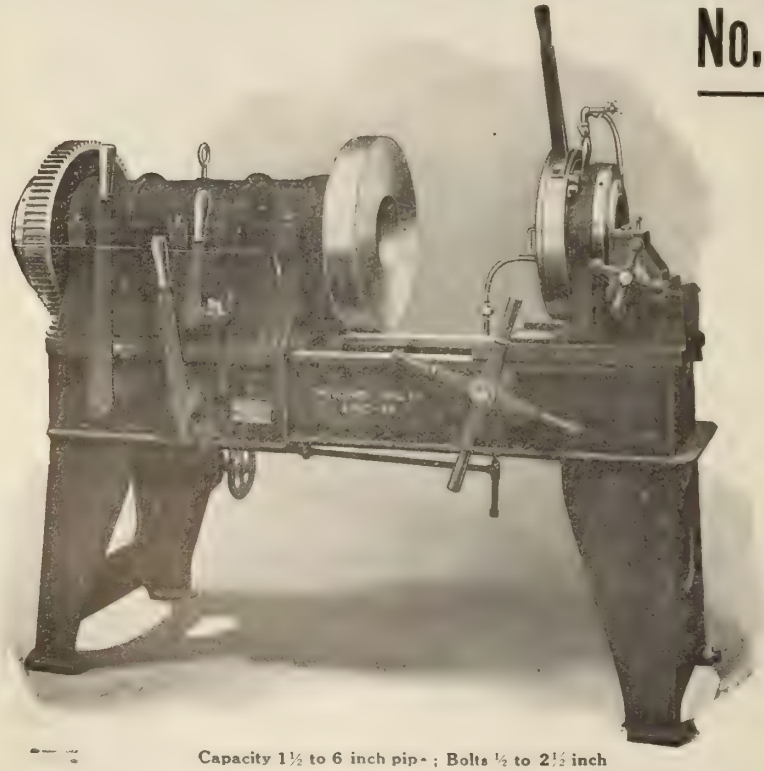
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MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1½ to 6 inch pipe; Bolts ½ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2"; ½" to 3"; 1" to 4"; 1½" to 6"; 2" to 8" and 3½" to 12".

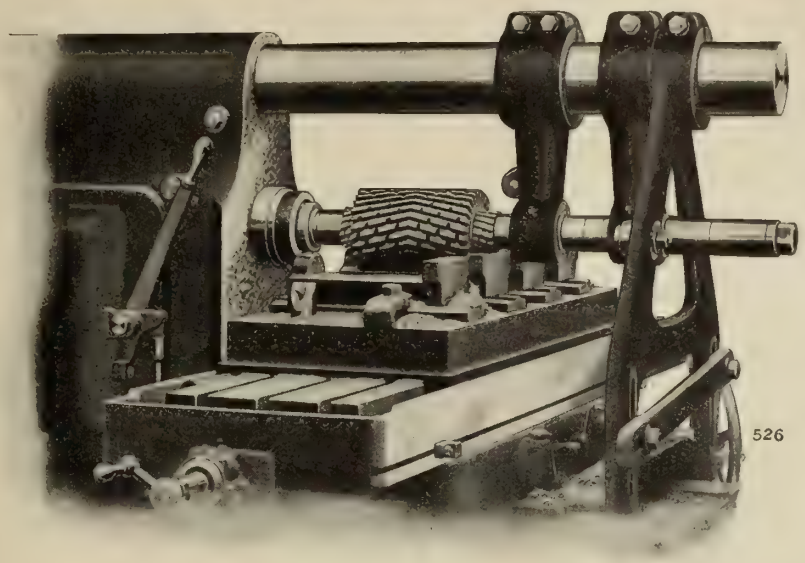
Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

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WILLIAMS TOOL CO.

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Do YOUR Milling the Cincinnati Way



526

THIS operation roughs out the inside of Cast Iron Vise Bodies. Total width of cut 15 inches; greatest depth 3-16 inch; length 6 inches. The largest cutter is 6 inches in diameter, 9 3-8 inches face, runs 32 revolutions, feeding 4 3-4 inches per minute.

The pieces are held in a string jig—each one clamped independently. The milled pieces are removed as fast as traversed by the cutter and others chucked in their places.

At the end of the cut the knee is lowered, the table returned, readjusted and a new cut started.

The operator then removes the last piece at the right-hand end of the jig and chucks a new one.

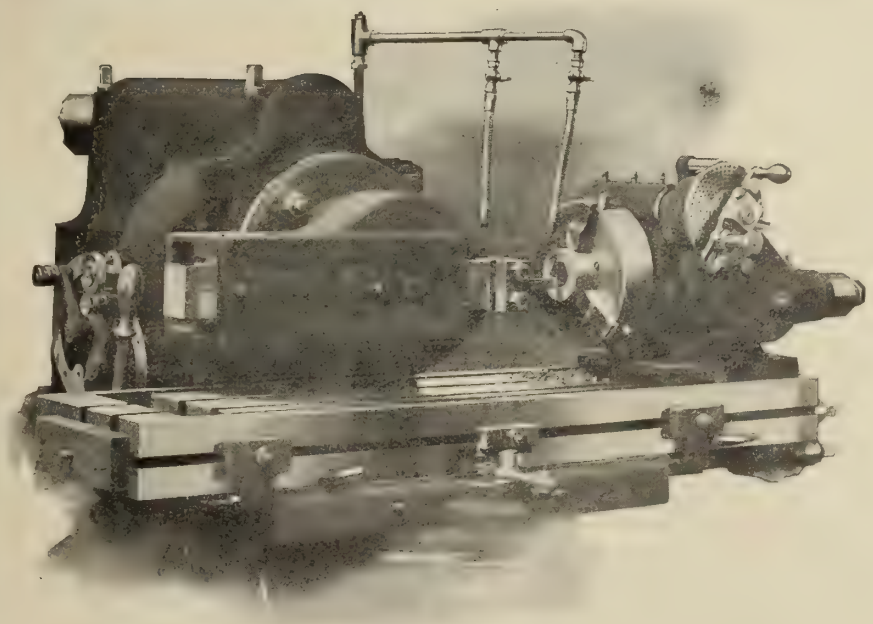
By this time the first one at the left has been milled and he repeats the above process by again chucking new pieces behind the cutter.

Both the operator and the machine are busy all the time. Neither waits for the other. The only time lost is returning and readjusting the table, and the TOTAL TIME PER PIECE IS ONLY 4 1-4 MINUTES. Let us show you how to mill your work the Cincinnati way.

The Cincinnati Milling Machine Company

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Canadian Agents—H. W. PETRIE, Toronto, Montreal and Vancouver



EVERY tool room should have a Milwaukee Universal Milling Machine, every universal milling machine should have a slotting attachment and every tool room foreman should have our latest book—to be had for the asking.

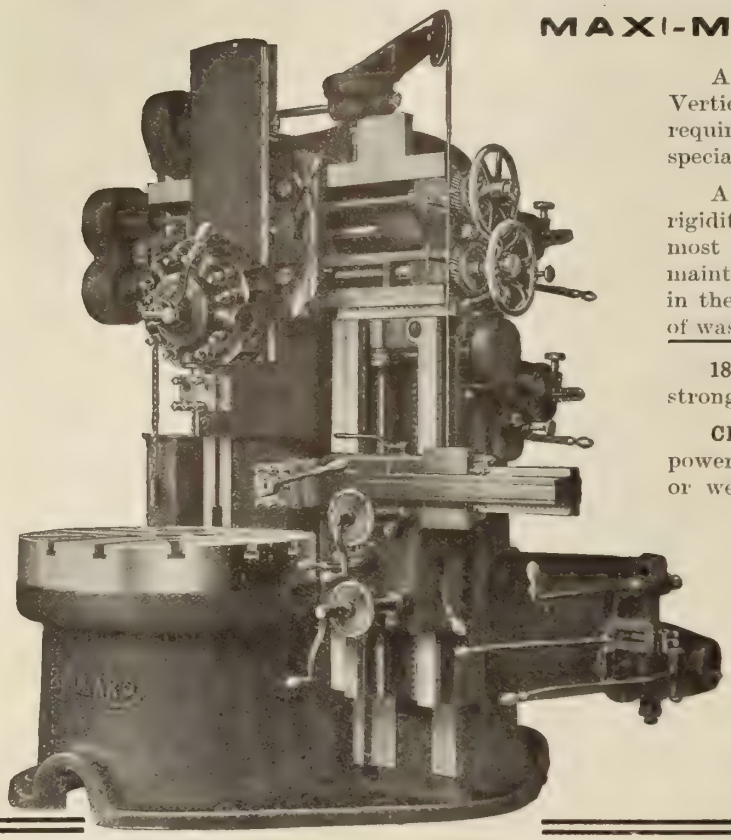
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MANUFACTURERS MILWAUKEE, WIS.

Canadian Agents:—A. R. WILLIAMS MACHINERY CO., Toronto, St. John, Winnipeg, Vancouver
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The 42-Inch Vertical Turret Lathe

MAXI-MILL TYPE



A development of the maximum possibilities of the Vertical Turret Lathe based upon a knowledge of the requirements gained by extensive observation and a specialized experience as makers and users thereof.

A machine tool of extreme power, having weight, rigidity and materials of construction to withstand the most severe usage, continuously, with a minimum of maintenance cost;—and operative features of proven value in the reduction of production costs by the "elimination of wasted time."

18,500 POUNDS OF SELECTED MATERIAL—it is strong and rigid.

CHROME NICKEL STEEL GEARING insures high power transmission continuously without breakage or wear.

CONTINUOUS FLOW LUBRICATION eliminates power loss and increases machine life.

CENTRALIZED CONTROL permits the operator to concentrate on production.

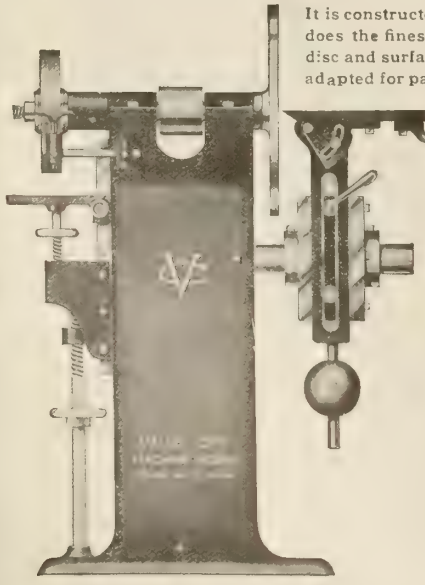
Circular CV 42 goes into full details and will be mailed on request.

The Bullard Machine Tool Co.

BRIDGEPORT, CONN., U.S.A.

No. 9 Disc and Surface Grinder

Here is the Machine That will Meet *Your* Requirements.



It is constructed on practical lines and does the finest kind of work. This disc and surface grinder is especially adapted for pattern shops, die makers and all kinds of tool and surface grinding.

Disc side has table tilting from 0 to 43 degrees Size of disc table, 10 x 10 in. Diameter of disc, 18 in.

It will solve your vibration problem. It is strongly built of one solid casting; and satisfactory tests have demonstrated that vibration is avoided.

Our Catalogue will Interest You. Write for it now.

Valley City Machine Works

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GRAND RAPIDS MICHIGAN

IMPROVED POWER HACK SAW



cuts bars 6x6 inches, either round or square. It is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

Your Special Attention

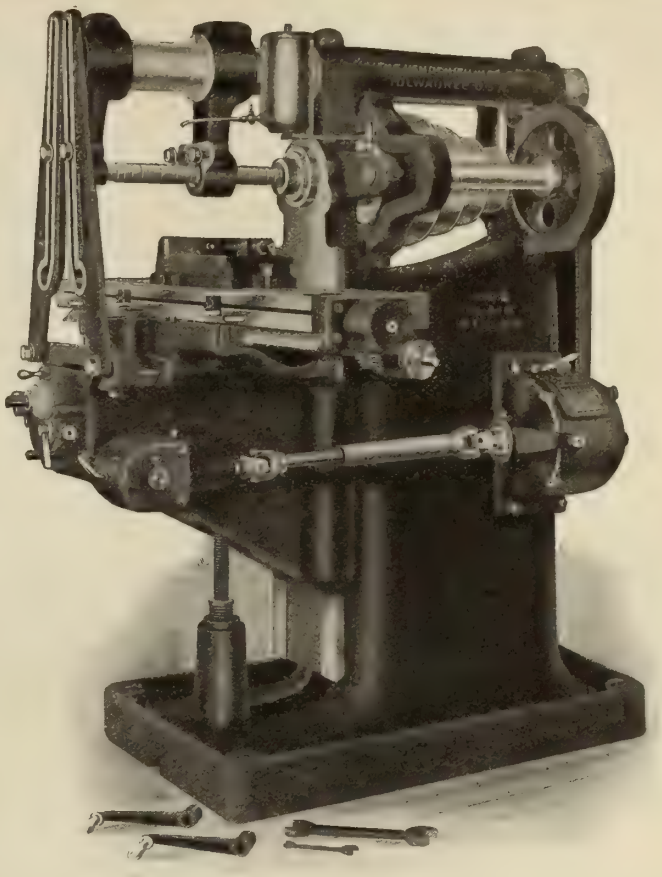
is called to the IMPROVED SAW GUIDE, which keeps the saw perfectly in line at all times. Only the finest material and skilled workmanship are used in the manufacture of this Hack Saw.

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The advertiser would like to know where you saw his advertisement—tell him.

KEMPSMITH
Plain Millers



Powerful: Have new style strengthened countershaft; very liberal belt surface; large back-gear ratio; the high efficiency of the feed mechanism throughout delivers maximum relative power at point of cut.

Massive construction, especially at points of strain and wear.

Simple, operative levers very few in number, concentrated for more convenient handling.

THEY ARE RELIABLE IN SEVERE MILLING. WONDERFUL IN THEIR WORKING QUALITIES.

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NEW HAVEN LATHES

Assure Unlimited Service

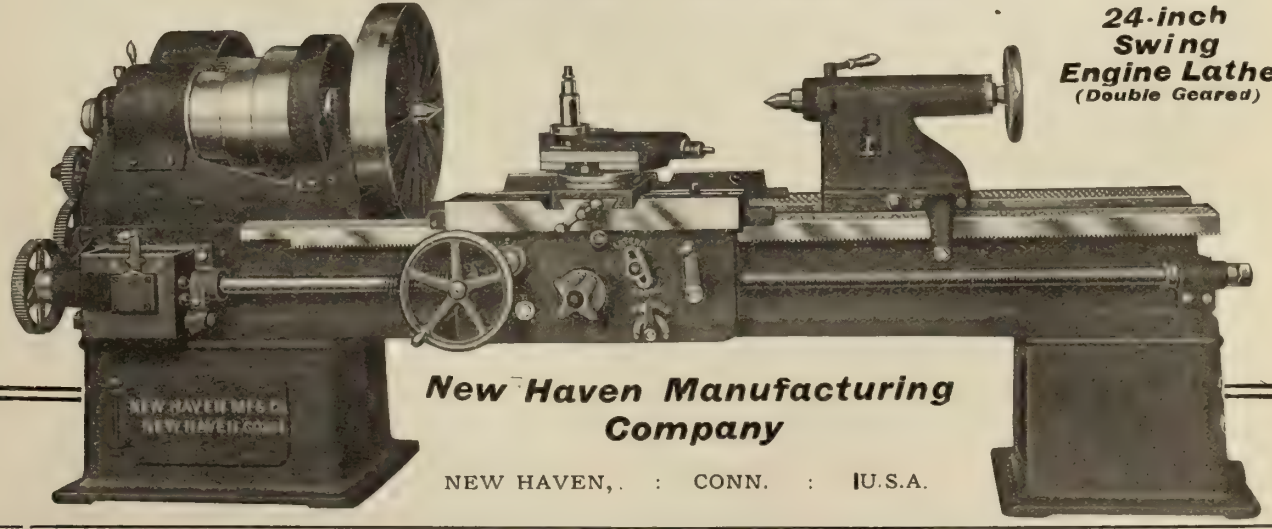
This high grade Engine Lathe is built for efficiency and reliability.

For continuous heavy duty.

There is no Lathe better qualified to give cost-reducing service with ease.

We guarantee absolute accuracy.

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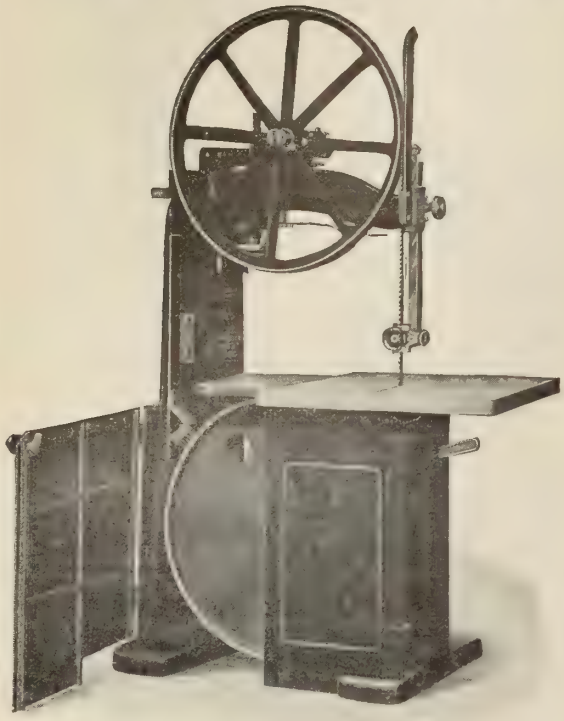


24-inch Swing Engine Lathe (Double Geared)

New Haven Manufacturing Company

NEW HAVEN, : CONN. : U.S.A.

The Most Intricate Scroll Work



No. 50 HIGH DUTY BAND SCROLL SAW
Equipped with Modern Safety Doors

can EASILY and QUICKLY be done on our

No. 50 HIGH DUTY BAND SCROLL SAW

To give you an idea of the superiority of this **High Duty Band Scroll Saw,** we publish below the contents of a letter received from a prominent manufacturer, whose name we will gladly send you if you desire.

"Some time ago I noticed one of your No. 50 Band Scroll Saws at work in another factory, and it appeared to work so nicely that the next time I needed a Band Saw, I decided to try one of yours, even though it was just about 50% higher than I had been paying for this class of machine.

I got such excellent results from it that I have since purchased eight machines. I am now using nine of your No. 50 Band Scroll Saws and am well pleased with the results I am getting from them."

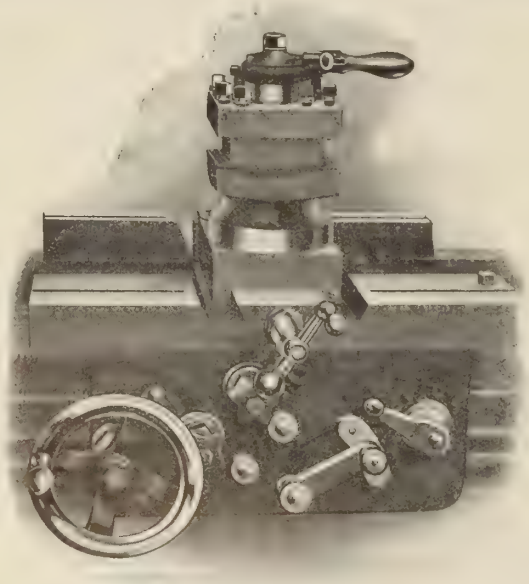
This machine is equipped with our Patent Knife-Edge Straining Device which allows the use of the thinnest blade possible—enabling the machine to turn out **high quality of work at a lower cost of production** than any other Band Scroll Saw on the market. This is only one of the many exclusive features entering into the construction of this machine. You ought to know more about it.

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SALES OFFICES: New York City, Chicago, St. Louis, New Orleans, San Francisco, Evansville, Los Angeles, Seattle, Vancouver, Atlanta, Buffalo, Baltimore



We want to furnish you with one of these

Four Sided Tool Posts

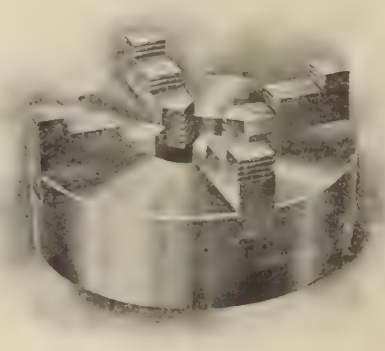
to go on your lathe. We fit them to any make of lathe so they operate by the regular cross feed screw. Don't stick to the old-fashioned single tool post, but insist on having your lathe equipped with a **Fay & Scott Patented Type.**

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FAY & SCOTT : Dexter, Maine

Canadian Agents—Williams & Wilson, Montreal, Que.; A. R. Williams Machinery Co., Toronto; A. R. Williams Machinery Co., Winnipeg; General Supply Co. of Ottawa, Canada.

Superior Universal Chucks



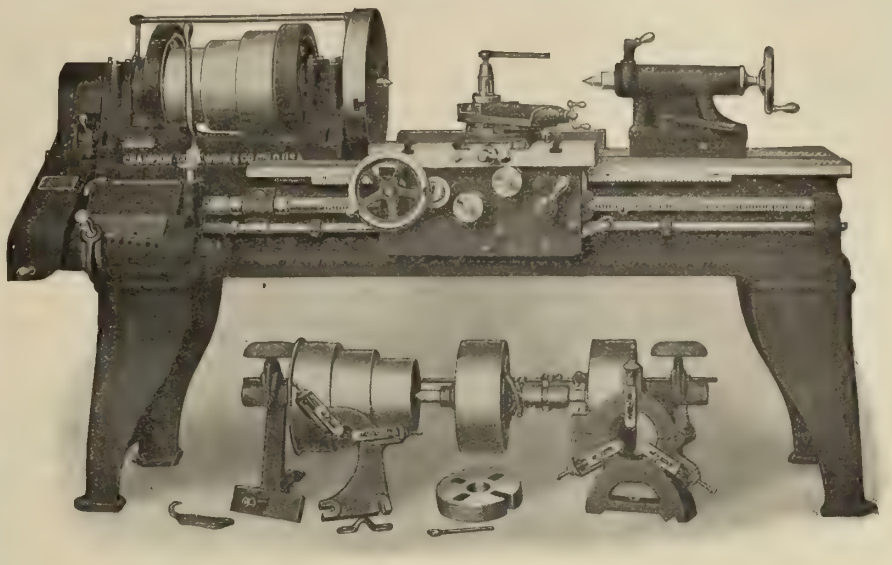
Superior Chucks will stand the hardest service and are fully GUARANTEED. In buying a chuck you naturally want the best, and in the SUPERIOR you have the highest grade quality and accuracy, combined with a price that will interest you.

If your dealer cannot supply you, write us for catalog and prices.

Schuchardt & Schutte

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NEW PATENTED DOUBLE BACK GEAR CHAMPION LATHE



16-in. Quick Change and Double Back Gear Lathe.

The New Way

Change from Back Gear to Double Back Gear or vice versa instantly without stopping the Lathe.

The Lever shown on front of the Lathe Headstock is for engaging instantly the Back Gear or Double Back Gear, or disengaging both, while the Lathe is running.

Can you afford to handicap your Lathe Hands by using the old type, with having to stop their machines and lose time by going to the back of the Lathe to adjust the gears to mesh every time it is necessary to engage or disengage the back gears? Neither can you afford to be without the many other conveniences of the CHAMPION LATHE.

Write for the "Quicker and Better Way."

10, 12, 14, 16 and 18 Inch Lathes.

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Station "B" CINCINNATI, OHIO, U.S.A.

POWER PUNCHING AND SHEARING MACHINERY

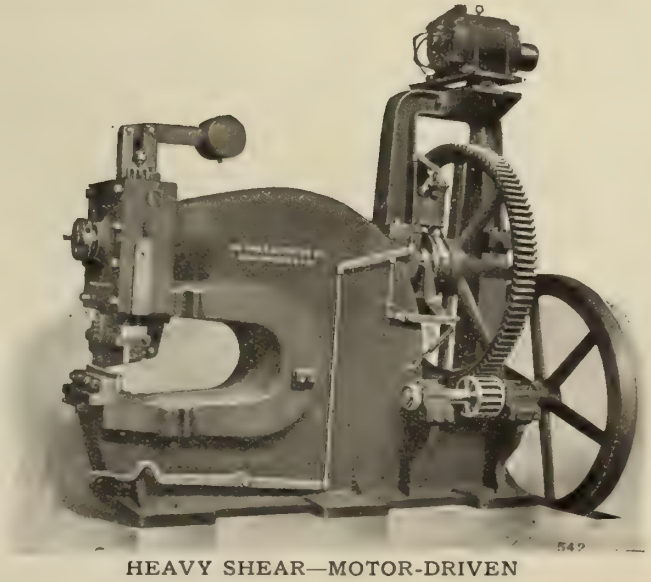
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For Light and Heavy Work.

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Beam Punching and Coping Machines.

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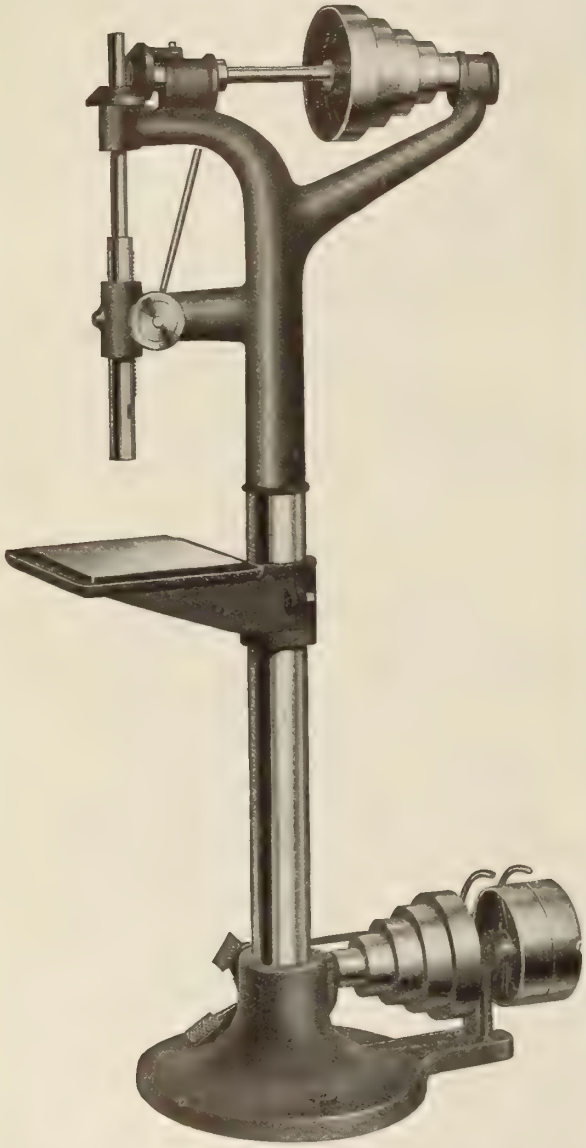
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Designed and Manufactured by

THE LONG & ALLSTATTER CO.

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Another New Sibley Drilling Machine

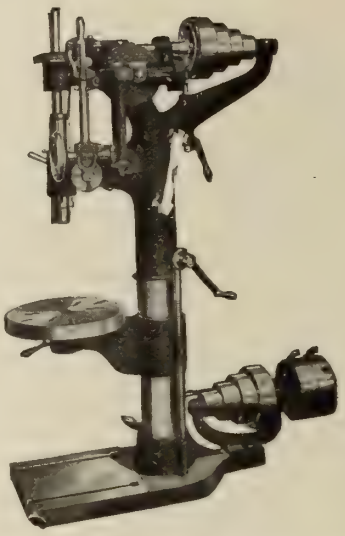


Self-oiling throughout.
Sixteen-inch Swing.

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Complete line. 8 inch to 50 inch swing.

Gang Drills.—Horizontal Drills.

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No. 3 Multiple Spindle Drill. 12¾ inch Holes

FOX Multiple DRILLS

More Holes! Lower Cost!

That is the trail that marks the path of this Fox product.

Machines built to drill 24 holes at once, covering lay-outs from 9x12 inch to 24x36 inch rectangular and 9 to 36 inch circular.

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PLAIN, UNIVERSAL and INTERNAL GRINDERS

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We are striving to keep the confidence of the mechanical world by the superiority of our workmanship, and by producing the BEST GOODS possible with up-to-date machinery, expert engineers, and high-priced labor

"Modern Machines" and tools are the efficient, guaranteed kind, and will give long and honest service.

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MODERN TOOL COMPANY

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Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

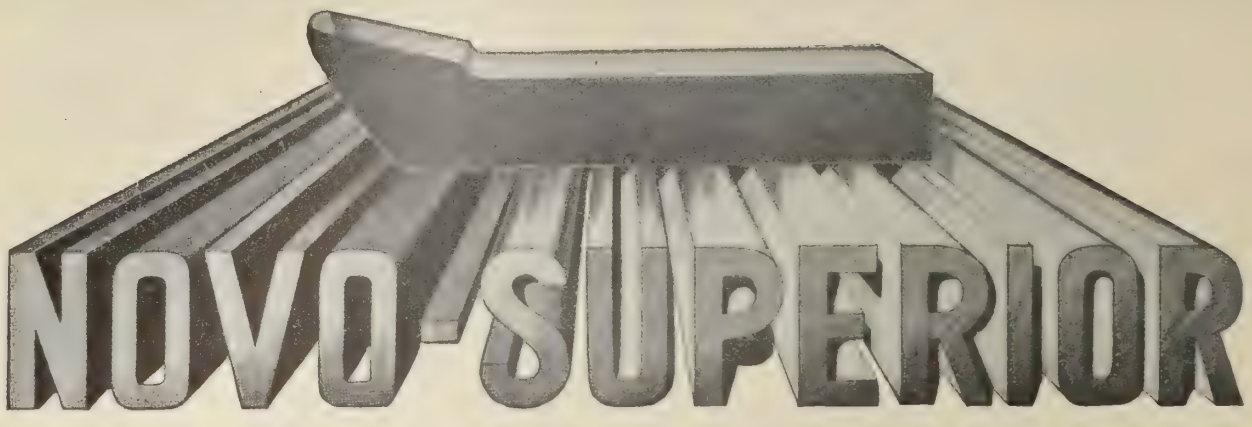
Cylindrical, Surface, Disc,

Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

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Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

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BRASS and IRON CASTINGS. BOILERS and REPAIRS.

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SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

Wire of every description for Slugger and Standard Screw Machines.

The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director

LEVIS, Quebec

FIRTH'S TOOL STEELS ARE THE BEST

SPEEDICUT B. C.
SPEEDICUT MAXIMUM } Our latest productions in High Speed Steel

The toughest, keenest cutting, most durable steel manufactured for Lathe and Planer Tools Milling Cutters, Taps, Reamers, Drills, Blanking Dies, Woodworking Tools, Etc.
For all-round efficiency for **general** purposes **Speedicut** holds first place.

FIRTH'S EXTRA TOOL STEEL
FIRTH'S BEST TOOL STEEL } Standard brands known everywhere In all tempers. For all purposes

Crucible Sheet and Strip Steel, Pivot Steel, Cutlery Steel, Nickel Alloy Steels, Mining Drill Steel Shoes and Dies, Locomotive Tyres, Heavy Forgings, Projectiles, Files and Rasps.

THOS. FIRTH & SONS, Limited

Norfolk Works: SHEFFIELD, England

Canadian Warehouse: 507 St. Paul Street, Montreal

J. A. SHERWOOD, Agent

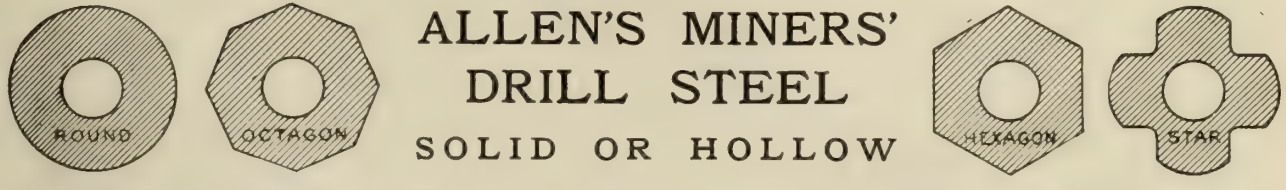
EDGAR ALLEN & CO., LIMITED

330 ST. JAMES STREET, MONTREAL

Can supply you from stock with the exact quality of Tool Steel you are looking for, whether it is for special purposes or ordinary use, from the world-renowned **ALLEN'S**

AIR-HARDENING **High Speed Steel** down to **Mild Grade Carbon Steels,**

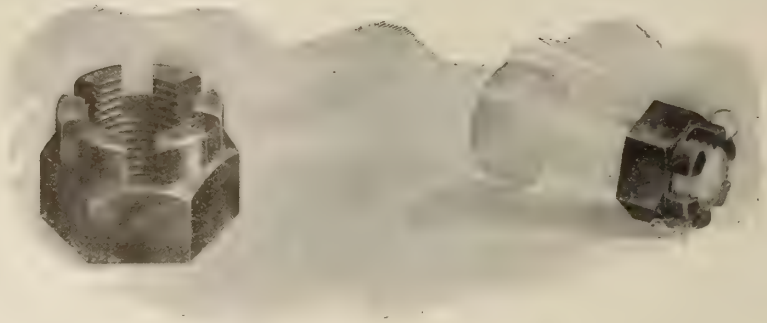
In 10 different qualities to suit all purposes
At 10 different prices to suit all customers



ALLEN'S MINERS' DRILL STEEL
SOLID OR HOLLOW

ALLEN'S STEEL CASTINGS, CEMENT MILLS AND ROTARY KILNS, RAILWAY POINTS, CROSSINGS, AND SPECIAL CASTINGS, IN ***ALLEN'S*** IMPERIAL ***MANGANESE*** STEEL.

YOU NEED THE EDGAR ALLEN PRODUCTS
TO SAVE TIME TO SAVE EXPENSE TO MAKE PROFITS
GIVE US A TRIAL



Castellated Nuts

A. L. A M. Standard made and carried in stock at Montreal Plant are the kind which hundreds of automobile and other makers of fine machinery are using in large quantities

You can get them in all the popular sizes. Specify soft or Case-hardened We carry the A. L. A. M. Finished Nuts too, also semi-finished Nuts in "V" thread

WRITE FOR CATALOGUE AND PRICES. DELIVERIES PROMPT.

NAMCO

The National-Acme Manufacturing Company

MONTREAL, St. Elizabeth St. and G.T.R. NEW YORK, 77 White Street.
BOSTON, 141 Milk Street. CHICAGO, 549 Washington Blvd.
DETROIT, 1222 Majestic Bldg. ATLANTA, Candler Bldg.
WAREHOUSES—New York, 77 White St.; Chicago, 549 Washington Blvd
PLANTS—Cleveland, Ohio. Montreal, Canada.

Nicholson - Made FILES

have proven their supremacy in the file world by their clean cutting qualities and their lasting service.



No other file on the market is better suited for high-grade work than the Nicholson - Made Files. They retain their sharpness and stand up under usage where others fail.

Nicholson-Made Brands manufactured in Canada are:—AMERICAN, ARCADE, GREAT WESTERN, GLOBE, EAGLE, McLELLAN, KEARNEY & FOOT, J.B. SMITH.

WRITE FOR PRICES OR ASK YOUR DEALER

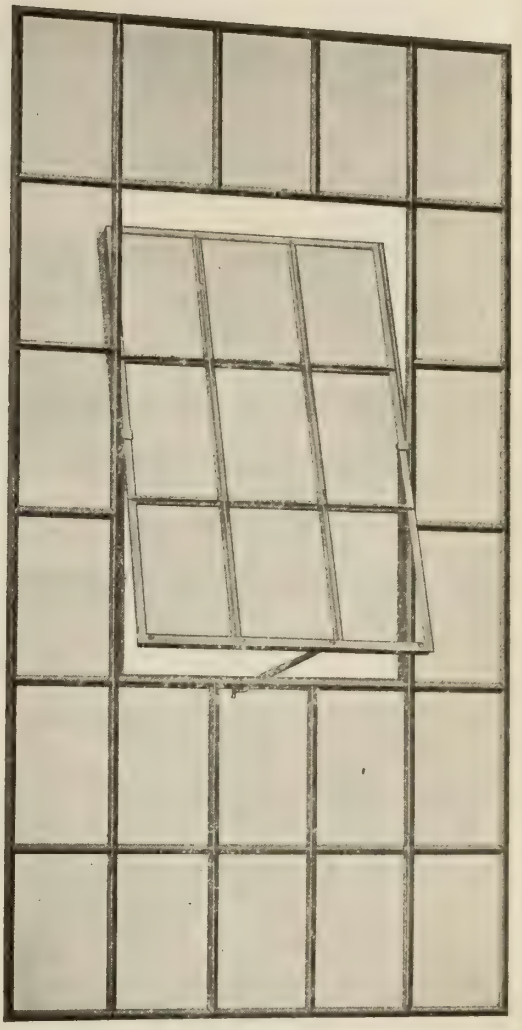
NICHOLSON FILE CO.

DOMINION WORKS - PORT HOPE, ONT.

The advertiser would like to know where you saw his advertisement—tell him.

"Fenestra" TRADE MARK

What "Fenestra" Fireproof Sash Will do for YOU in YOUR Factory



¶ Protect from fire.

¶ Save insurance premiums.

¶ Prevent burglary by sneak-thieves or tramps.

¶ Admit from 25 to 40 per cent. more light than wood sash.

¶ Ventilate freely, supplying fresh air and removing foul air, smoke, gas, etc.

¶ Last indefinitely—Fenestra sash is impervious to rust, acid and smoke fumes.

¶ Greatly inprove the appearance of your factory and stamp its owner as a progressive man, choosing by common sense instead of cob-webbed precedent.

Don't take your opinions on Steel Sash second-hand. Get a copy of Catalog "F-2" and find out all about them for yourself.

STEEL and RADIATION, Limited

TORONTO - Fraser Ave., 92 King St. West
MONTREAL - - 138 Craig St. W.
OTTAWA - - - 85 Bank Street
QUEBEC - - - 153 St. Paul Street
ST. JOHN - - - 13 Germain Street
WINNIPEG - - - 334 Garry Street
CALGARY - - - 309 8th Avenue W.
VANCOUVER - - 416 Pacific Building

"Fenestra" TRADE MARK

Don't fail to mention "Canadian Machinery" in writing to advertisers.

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

REPRESENTATIVES

L. F. McClernan
1243 Peoples Gas Bldg.
CHICAGO

L. F. McClernan
1417 Ford Bldg.
DETROIT

L. D. Rockwell
U.S. Express Bldg.
NEW YORK

OXYGEN

Of guaranteed purity by the Claude's Process. The largest and most up-to-date plant now in operation on this continent.

OXYACETYLENE

AND ALL SYSTEMS OF

WELDING and CUTTING PLANTS

For welding steel, cast iron, copper, brass, lead, aluminum. For cutting steel and wrought iron.

SAMPLE AND REPAIR WORK UNDERTAKEN

R. J. LEVY

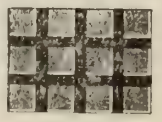
MANUFACTURER OF OXYGEN

MAISONNEUVE - MONTREAL

Telephone East 6713

LAFFITTE

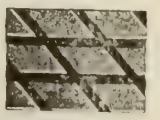
The New French Brazing Compound



No. 1
For Brazing Brass, Red Copper & Bronze



No. 2
For Brazing Red Copper and Iron



No. 3
For Brazing Iron and Steel

These three contain all the necessary ingredients for a perfect braze, including a great proportion of copper solder.
As they melt at different heats it enables the brazier to have a solder which fuses at a lower heat than the metal being brazed.
Does quicker, cleaner, better work. No swelling or blistering.
Leaves braze free from oxides and residue ready to finish.

SAMPLES FREE on request.

Complete stock of Laffitte Products carried by active dealers throughout Canada

THE PHILLIPS-LAFFITTE COMPANY

801 Penna. Bldg., Philadelphia, Pa., U.S.A.

ONE HOUR'S WORK

WITH AN ELECTRIC WELDING MACHINE



Sixty minutes' work and over a thousand in this pile (Count 'em.)

THE BOY IS WELDING STEEL HOOPS FOR BARRELS

He places a hoop in the welder—the jaws come down and clamp the stock, the circuit is closed—the weld completed—the circuit breaker opens—the wire is released—all done automatically. Time: 3 seconds or 20 per minute.

It's a power driven machine requiring about half a horse power to run it. The speed can be varied from 15 to 30 welds per minute depending on size of stock. Can be used for a great variety of small work where it's the quantity that counts.

Figure the cost:	Current at 5c. per K.W. hour for 1,000 welds	.10
	Boy's time at 20c. per 1,000 welds -	.20
	Total for 1,000 welds - - -	.30

Ten thousand pieces per day at a cost of three dollars

This is only one of nearly fifty different kinds and styles of welders we make and if we haven't got what you need for your work—we'll make it. That's our specialty—building welding machines: good ones, of course, or we wouldn't be the largest manufacturers of welding machines in the country to-day.

By the way, our new bulletin is a text book on Spot Welding, or riveting without rivets, and it's yours for the asking.

No Lease. No License. No Royalty

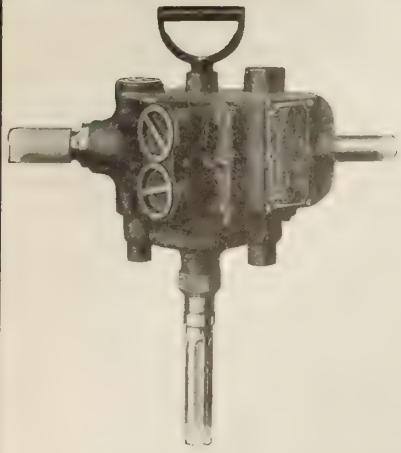
The Toledo Electric Welder Company

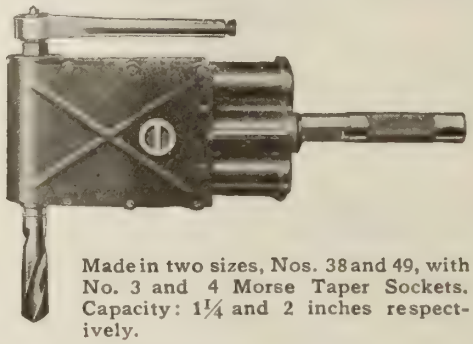
CUMMINSVILLE, - - - CINCINNATI, OHIO

Cleveland AIR TOOLS

Cleveland Corner Drill

FOR CLOSE QUARTER DRILLING





Made in two sizes, Nos. 38 and 49, with No. 3 and 4 Morse Taper Sockets. Capacity: 1¼ and 2 inches respectively.

¶ Adapted to Drilling and Reaming in narrow places where the Center Spindle Drill cannot be used.

¶ Can drill or ream within 1⅛ inches of side wall or corner.



Riveting Hammers and Chipping Hammers are made in sizes to suit all classes of work and are fitted with either outside or inside latch as prefered.

Cleveland Four-Piston Air Drills are made in sizes to suit all classes of work and furnished reversible or non-reversible as required

Write For Illustrated Catalogue "L"



DUST PROOF

Cleveland Sand Rammers for Floor, Flask and Bench Ramming. Made in sizes adapted to general Foundry and Steel Castings Work

The Cleveland Pneumatic Tool Co.

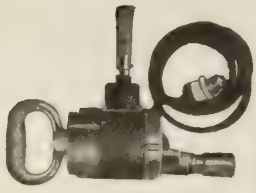
NEW YORK — General Offices and Works, Cleveland, Ohio, U.S.A — CHICAGO

A. R. Williams Machinery Co., TORONTO, WINNIPEG, VANCOUVER and ST. JOHNS

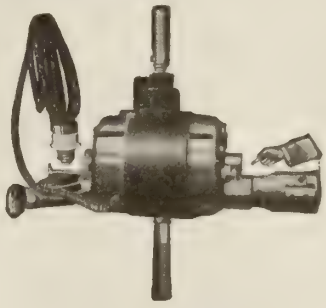
Williams and Wilson, MONTREAL

U. S. Electric Drills and Grinders

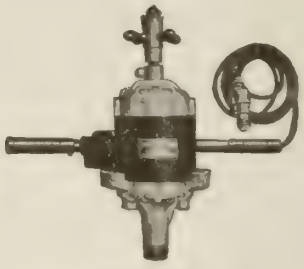
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



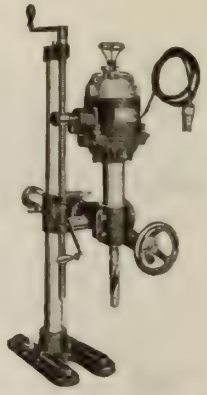
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

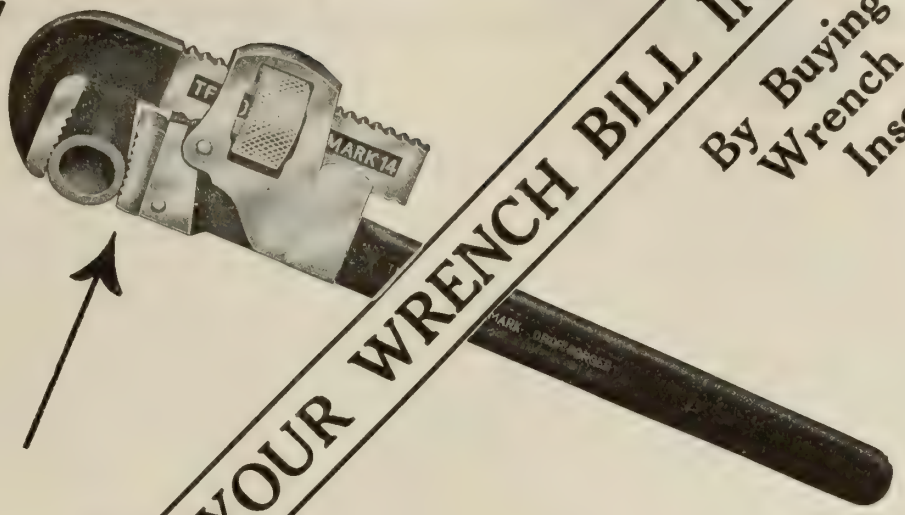
Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - - OHIO, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

USE The Trimo Pipe Wrench



AND CUT YOUR WRENCH BILL IN TWO

By Buying the Pipe Wrench with the Inserted Jaw In the Handle

Send for Catalog No. 200

Made by The

Trimont Mfg. Company

55-71 Amory St. - Roxbury, Mass.

PNEUMATIC TOOLS

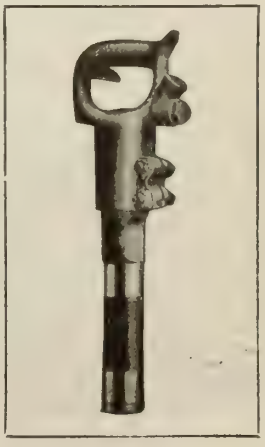


The absolute safety and simplicity of transmitting compressed air, its wide range of profitable uses and the economies effected by its uses, give it an indisputable position of supremacy as a means of transmitting power for operating small portable tools.

Pneumatic tools are not delicate, complicated pieces of machinery, but positively simple, rugged little money savers, made to stand rough usage, yet maintain their efficiency.

In "Imperial" designs wearing parts are reduced to the reasonable limit of simplicity, and manufactured to give the greatest satisfaction.

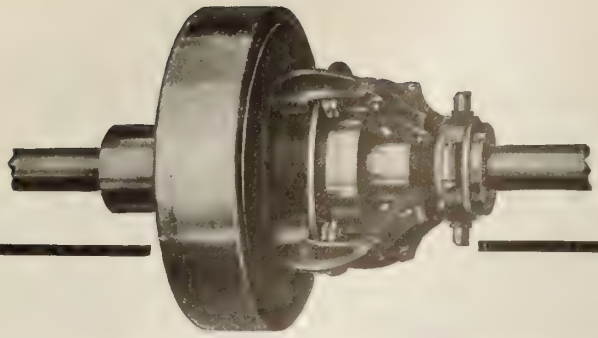
No part of a plant equipment, representing the same investment, will do more to reduce labor costs, increase output and enlarge dividends than a good pneumatic tool equipment. We firmly believe that "Imperial" tools represent the very best sustained value, first costs, maintenance and operating costs being considered. They are thoroughly well designed, embody all practical up-to-date improvements and give very exceptional efficiencies. These features have won for "Imperial" tools their present favored position.



CANADIAN RAND CO., LIMITED

Commercial Union Building, MONTREAL, Que.

TORONTO COBALT WINNIPEG LETHBRIDGE ROSSLAND VANCOUVER SPOKANE HALIFAX SYDNEY



THE SAFEGUARD

If, because of several recent burglaries in your neighborhood, you had decided to install burglar alarms on your doors and windows, you wouldn't put them on all the windows but one, and that one a back window in a secluded nook where thieves might be most apt to break in and steal your money. Why should you make the same mistake in buying clutches?

Your primary reason for purchasing clutches is to safeguard your power—your money—to shut off idle machines or groups of machines and prevent them from robbing you. But there is that "back window in the secluded nook" where, if you only knew it, more of your power can be appropriated than the saving in control can offset—and that is while driving with ordinary slipping friction clutches.

There is but one clutch that absolutely safeguards all your power—your money—the POSITIVE Combined Jaw and Friction Clutch. The Jaws do the work and they are positive. Therein lies The SAFEGUARD.

The Positive Clutch & Pulley Works, Limited

TORONTO, ONT.

AMERICAN WORKS, BUFFALO, N.Y.

GOODHUE BELTING



GOODHUE BELTING EFFICIENCY is the result of many years of diligent efforts to produce a superior belting at a reasonable cost.

Goodhue Belting is guaranteed to stretch from 15 per cent. to 25 per cent. less than any other belting manufactured.

Wouldn't its use mean a saving to you? Think of the time you would save in shortening. Goodhue Belting is noted for its perfect and reliable "cling" on the pulley—a cling that transmits every particle of power that your engine develops. Compare it with any other belting. Comparison has led to our success.

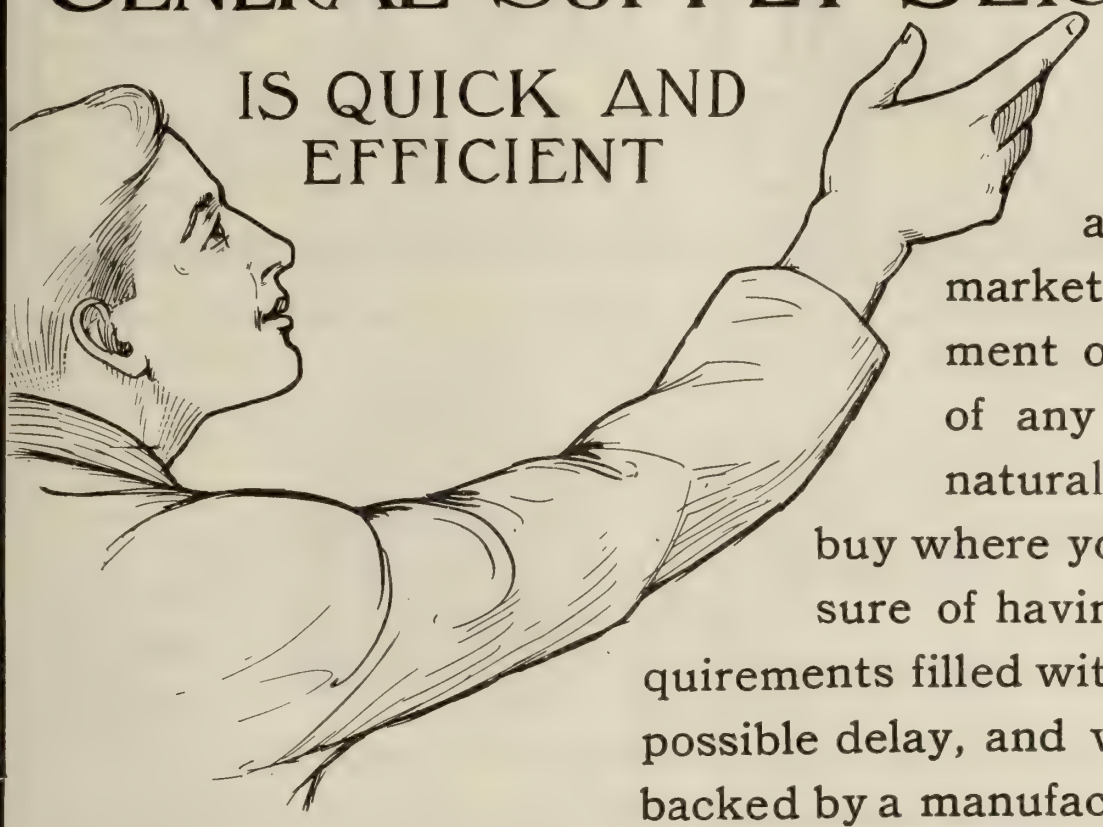
Our brands are "Extra," "Standard" and "Acme" Waterproof Belts, which are made to suit the varying conditions of use, all being absolutely guaranteed to give the highest class service. ***Write for prices.***

J. L. Goodhue & Co., Ltd., Danville, Que.

The advertiser would like to know where you saw his advertisement—tell him.

"GENERAL SUPPLY SERVICE"

IS QUICK AND EFFICIENT



When you are in the market for equipment or supplies of any kind you naturally want to buy where you can feel sure of having your requirements filled with the least possible delay, and with goods backed by a manufacturer with a reputation to maintain.

Some of Our Lines

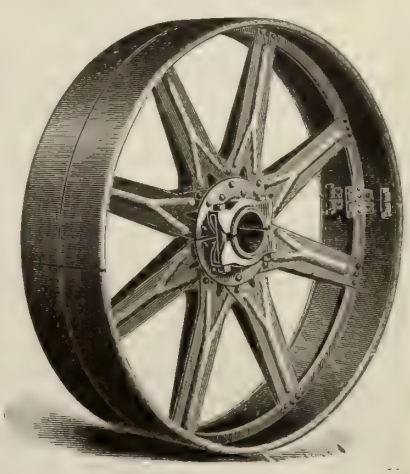
Among the prominent firms we represent are the following:—

London Machine Tool Co., Machine Tools.
John Steptoe Shaper Co., Shapers.
R. K. LeBlond Co., Milling Machines, Grinders & Lathes.
Fay & Scott, Lathes.
Mueller Machine Tool Co., Radial Drills.
H. G. Barr, Sensitive Drills.
Cleveland Twist Drill Co.
South Bend Machine Tool Co., Lathes.
Hisey-Wolf Machine Co., Electric Drills.
American Pulley Co., Pressed Steel Pulleys.
Standard Pressed Steel Co., Steel Hangers.
Beardmore Belting Co., Leather Belting.
Vi-Balata Belting.

Besides our general line of Mill Supplies, Contractors' Plant and Supplies, Transmission Equipment, etc., we have recently added a list of first class Machine Tool agencies, and have engaged special salesmen to look after this department, who have made this line their special study for years.

When you are in the market for machine tools it will pay you to let us quote.

We have a large stock of "AMERICAN" Steel Split Pulleys in our warehouse. Come in and see them. Made in sizes 6 to 60 ins. diameter and 2 to 36 ins. face. Also large stock of Pressed Steel Hangers.



Let Us Have Your Enquiry.

The General Supply Co. of Canada, Limited

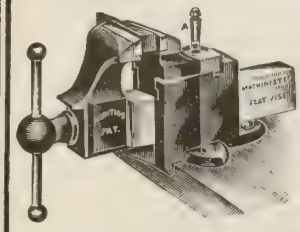
OTTAWA TORONTO WINNIPEG

115-125 ADELAIDE STREET WEST



HINTS TO BUYERS

Do Not Be Misled by Inferior Imitations.



There is but one

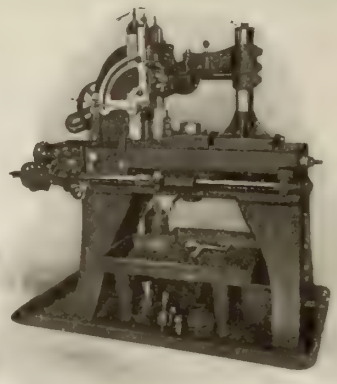
PRENTISS VISE

Made by

Prentiss Vise Company

Hardware Building, 106-110 Lafayette St., Cor. Walker St., NEW YORK

Canadian Agents: A. McFarland & Co., Coristine Bldg., Montreal



The Whiton AUTOMATIC Gear Cutting Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.



ROCKWELL MELTING FURNACES

Made in standard sizes, taking crucibles from No. 20 to 100.

Construction simple, strong and durable.

Lining made of standard 9-in. fire brick, easy to repair.

Not expensive.

Write for Catalog No. 26

W. S. ROCKWELL COMPANY

50 CHURCH ST., NEW YORK (Hudson Terminal Bldg.)

(The Original Furnace Rockwell)

NORTON JACKS

Standard on the Leading Railroads

Made in Canada.

Stock carried for **immediate shipment.**



Manufactured only by

A. O. NORTON,

COATICOOK, Prov. QUEBEC.

STOCK CARRIED BY

MUSSENS LIMITED, - Montreal and Winnipeg

H & E PATENT BALL BEARING LIFTING JACKS

for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.

Made in plain and foot lift styles, fully guaranteed.



Manufactured by

H & E Lifting Jack Company

WATERVILLE, QUE.

Stock carried by F. H. HOPKINS & CO. Montreal

CUT GEARS

THEORETICALLY CORRECT

IN

RAWHIDE OR METAL

ROBERT GARDNER & SON LTD

Nazareth St. — MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.

Thor

PISTON AIR DRILLS



Sold in Canada by
H. W. PETRIE, Limited
Toronto
Montreal
Vancouver

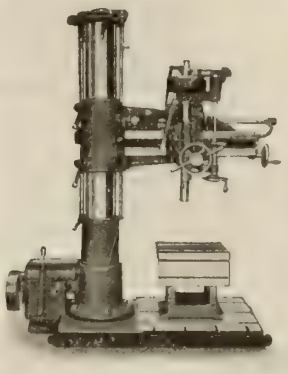
The Drill with CORLISS VALVE MOTION

30% greater efficiency guaranteed.

Independent Pneumatic Tool Company

Chicago New York Pittsburg San Francisco

Mr. Drill User, one moment, please—



Will you note the locations of the various operating levers on the MUELLER Radial Drill, and then tell us if you know of a Radial Drill that can be more easily operated than our drill? We know you will have to admit there is none.

This, however, is only one good feature of our machine—you had better ask us for a copy of our Radial Drill Book and become acquainted with all of the others

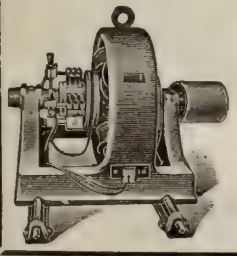
Book is Free

The Mueller Machine Tool Company

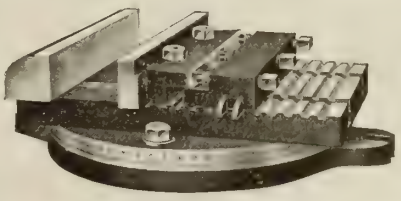
Cincinnati, Ohio, U.S.A.

YOU NEED MORE LIGHT
IN YOUR FACTORY. WRITE

TORONTO & HAMILTON ELECTRIC CO.



MANUFACTURERS OF
Dynamos
for Light and Power
AND ALL
ELECTRICAL APPARATUS



Union No. 76

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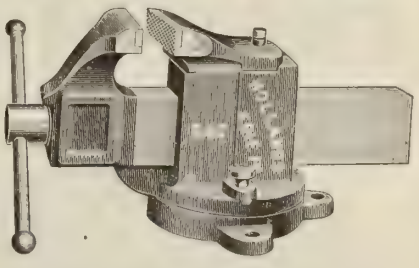
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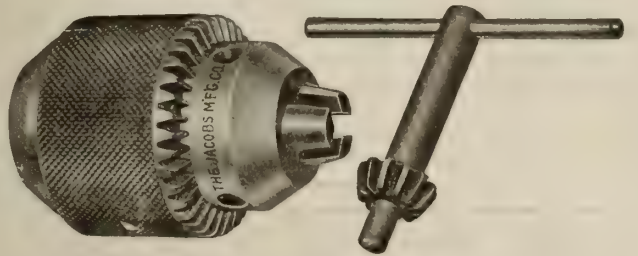
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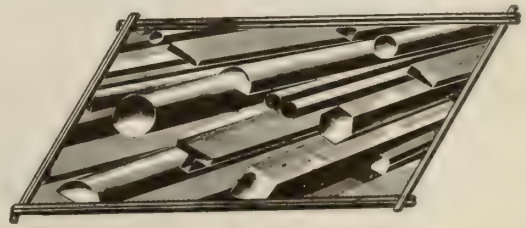
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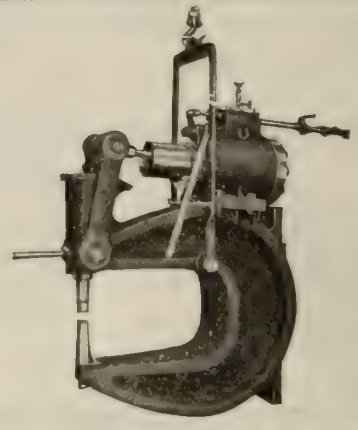
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1—40	"	"
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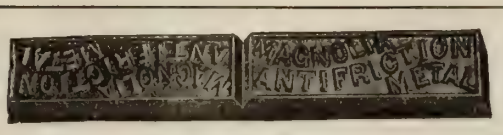
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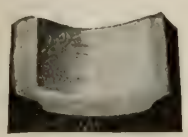
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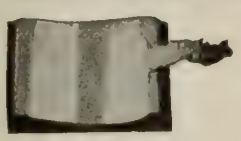


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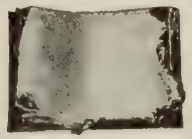
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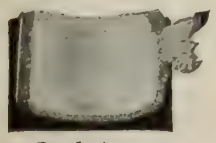
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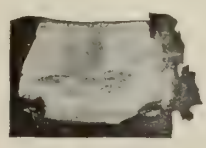
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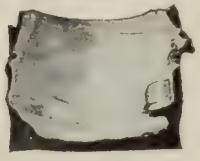
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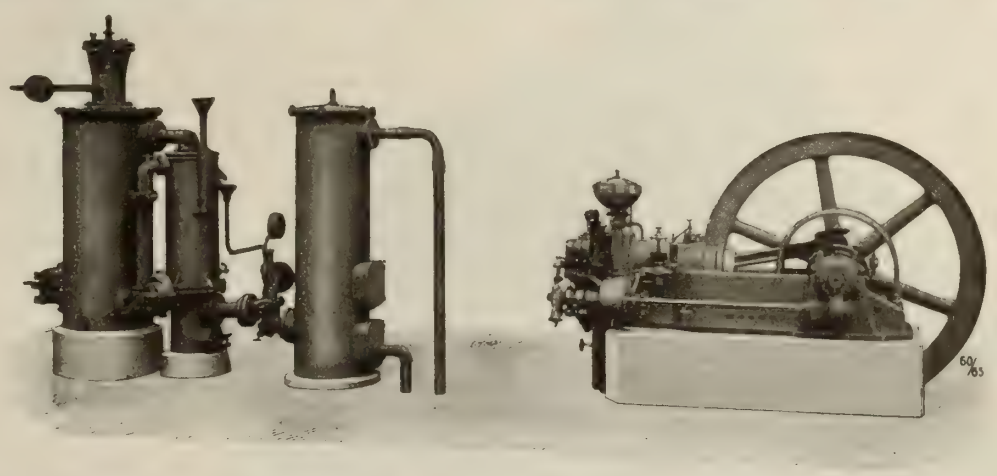
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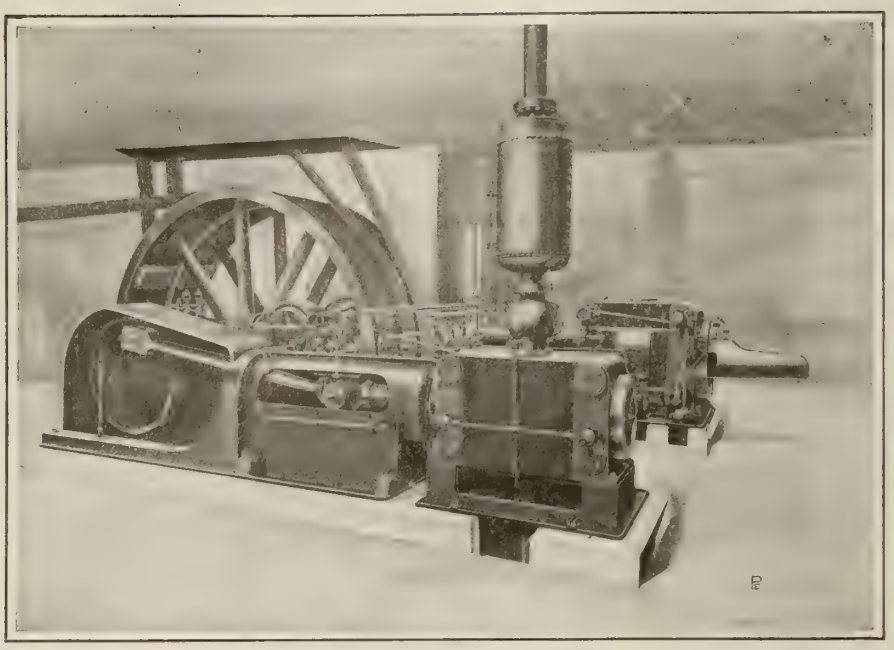
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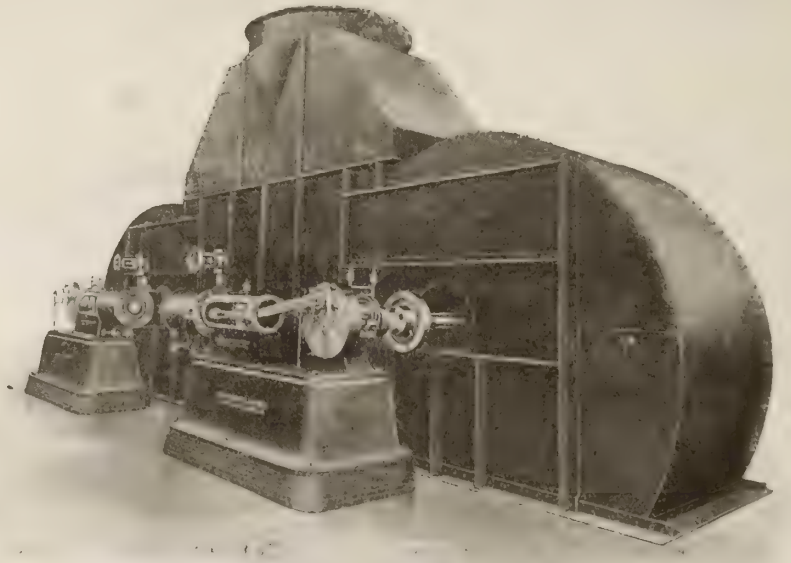
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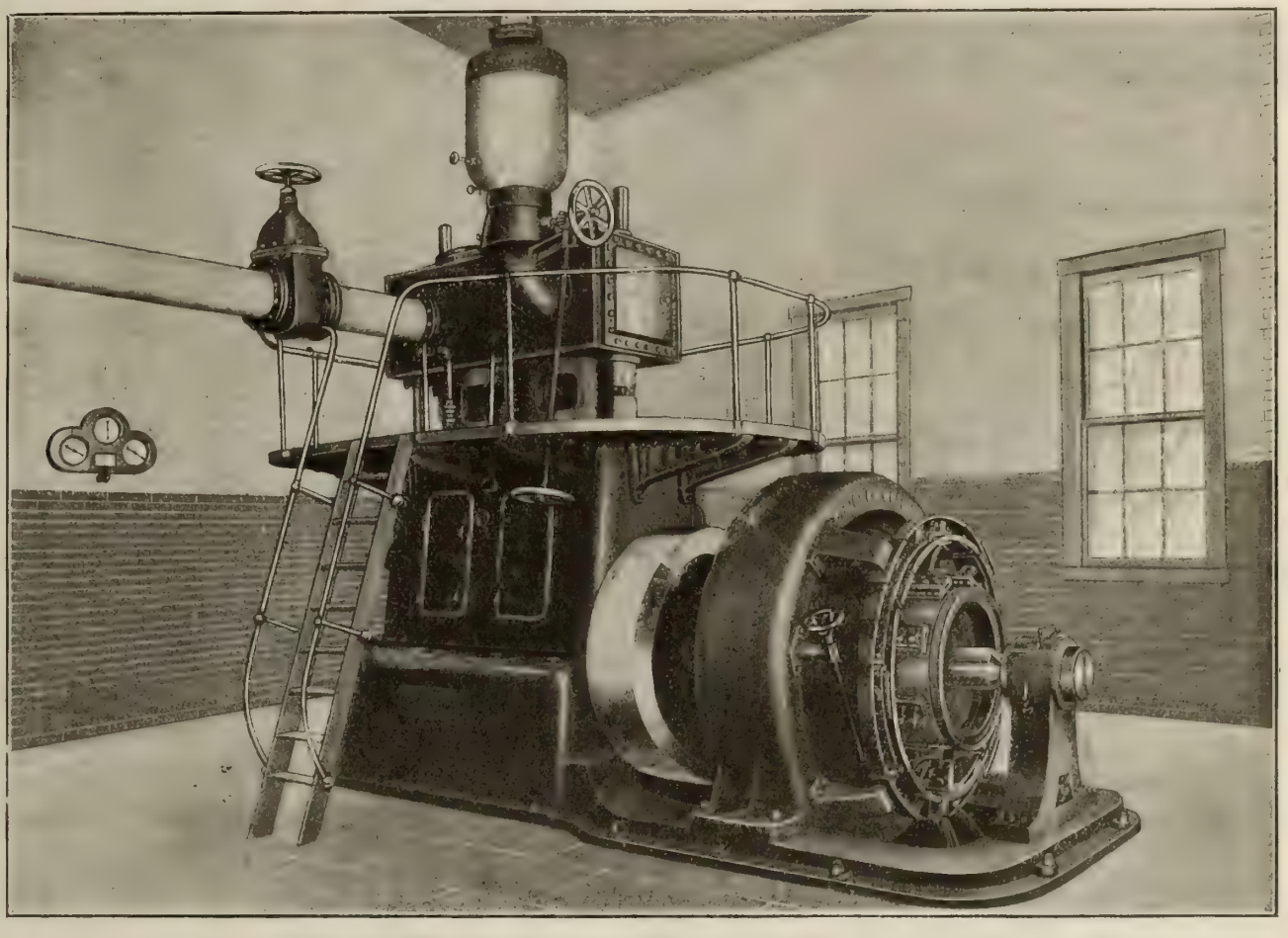
With the Sheldon Mechanical Induced Draft System you can cut the cost of fuel in half, by utilizing a cheaper grade, or can secure better and almost smokeless combustion from the same grade of fuel that you are now using.

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Three Crank Compound
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Oil Pressure of 15 to 20 lbs. to the bearings
Interchangeable parts.

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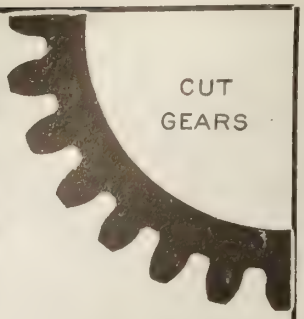
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(Registered Trade Mark)
Deflocculated Acheson-Graphite, Dag and Oil.

Graphite does not dissolve in any liquid or break under pressure, and these qualities, added to the unctious softness and purity, together with its non-coalescing nature, make Acheson-graphite ideal for lubrication purposes.

The process of deflocculation takes Acheson-graphite powder so fine that 99% of it will go through a sieve having 40,000 meshes per square inch, and sub-divides each grain of this finest powder into many still smaller particles—so small that they cannot be seen through a strong microscope.

Oildag is this deflocculated Acheson-graphite suspended in oil, where it neither floats or sinks, but is evenly distributed throughout. Oildag will flow anywhere the oil alone will go.

Mr. Robert A. Ross, E.E., of Ross & Holgate, Consulting and Supervising Engineers, Montreal, writes:

"As my firm are constructing and operating steam plants, we have wished to use a mixture of graphite and oil for cylinder lubrication, but have been prevented by the fact that the graphite settled out of the mixture. **This difficulty you have overcome,** and we are now assured of the best lubrication in the world, especially in superheated steam practice."

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ACHESON OILDAG COMPANY
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The Time Saved With a

"Cyclone" High Speed Chain Hoist

quickly pays for it. Because the eccentric gyrating gear principle on which it works is superior to any other, the "CYCLONE" will lift a given weight. with a given power, in less time than any other hoist made. We are willing to prove this at any time.

If hoisting forms any noticeable part of your work, you are losing money by sticking to time and work-wasting hoists. Write for Catalogue and full information about the "CYCLONE."

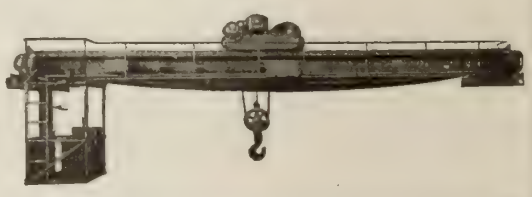
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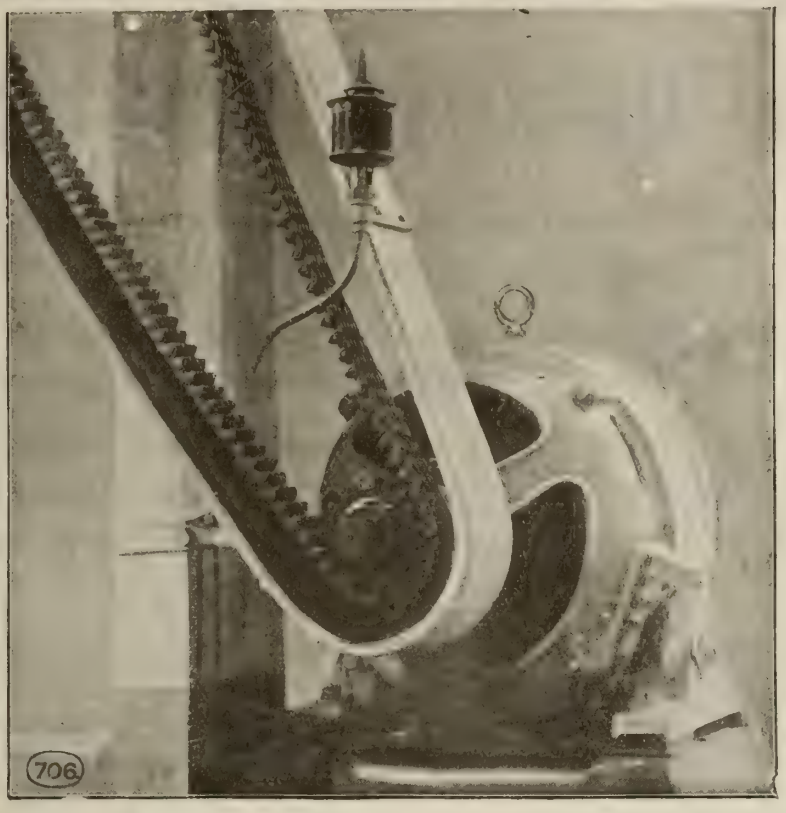
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All kinds of Cranes—
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Renold Chain Drive from 75 h.p. Motor

Transmit any power at a high speed as quietly and smoothly as a belt.

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We are completely equipping new factories with Renold Silent Chains.

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PROMPT DELIVERY OF RUSH CASTINGS TO 1,000 POUNDS WEIGHT

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THE TRIPLEX BLOCK



Quality! Quality! Quality!

ELEVATORS are insured—inspected. Their safety is constantly watched and guarded.

Chain blocks are seldom insured—seldom inspected. Their safety depends on the maker.

He must put the right materials and workmanship into every part. They must be always ready for every burden—every strain—every shock.

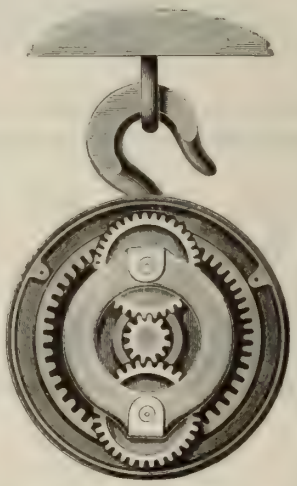
A broken chain block means damage—sperhaps to life—surely to property.

Guarantees don't count---you must have quality.

Triplex Blocks have the Yale Quality---the best materials that money can buy---the skilled workmanship of picked men.

TRIPLEX BLOCKS { **16 Sizes:** One quarter of ton to forty tons. **300 Active Stocks** all over the United States.

Send for Book of Hoists to-day---Yours for a postcard.



The simplest, strongest, most efficient, most durable hoisting device in the world.

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MONTREAL WINNIPEG TORONTO VANCOUVER
ST. JOHN, N.B. CALGARY SASKATOON
OTTAWA

Developments in the Electric Smelting of Iron and Steel

By Thos. D. Robertson, M. Met.

The Writer Gives an Interesting and Instructive Account of the Rapid Progress Being Made in the Electric Smelting of Iron and Steel, and From Figures and Data Secured From Carefully-made Tests of Operation, Shows This Process to be Commercially Valuable and of Extreme Importance to Such a Country as Canada, With its Immense Mineral and Water-power Resources.

EXPERIMENTS were made, under the Dominion Government supervision, at Sault Ste. Marie, Ont., in the winter of 1905-6 to test the feasibility of smelting Canadian iron ores, using charcoal as a reducing agent. While these preliminary investigations were regarded as satisfactory, no further experimentation was proceeded with in Canada.

Experiments in Sweden.

In Sweden, however, where the conditions governing the iron industry are similar to those in several provinces of the Dominion of Canada, the question of electric iron smelting was taken up in 1906. Three Swedish engineers, Messrs. Gronwall, Lindblad and Stalhane, commenced experiments, and after overcoming many preliminary difficulties, succeeded in the summer of 1908 in constructing a furnace which was durable and gave a good output. Profiting by experience, they determined to build a furnace of 700 h.p. at Domnarfvet, in order to test the commercial feasibility of the equipment. The experiments with this furnace were witnessed by Dr. Eugene Haanel, of the Government Department of Mines, Ottawa, and in 1909 a report was issued giving the results.

So impressed were the Swedish ironmasters with the working of this small Gronwall reduction furnace, that the Swedish Association of Ironmasters, "Jern Kontoret," determined to erect a furnace of 2,500 h.p. at Trollhattan; their idea being to thoroughly test the furnace on a commercial scale.

Furnace Test.

This furnace was started in November, 1910. Various consignments of ore were sent from the different mines of Sweden to be smelted. Most of the pig iron produced was sent to different steel works and made into steel: the quality of which was then tested.

The fuel used was charcoal, and a special store with belt conveyors and rope-way to the furnace top was built. A separate crusher house for the ore and limestone communicates by an inclined track with the furnace top. Power was supplied from the Swedish Government power station at Trollhattan, at a tension of 10,000 volts. This three-phase supply is transformed by means of two transformers of 1,100 K. V.A. each, with Scott's connections to two-phase current, which can be regulated between 50 and 90 volts.

Furnace Detail.

The height of the furnace from the ground to the charging platform is 45 feet. Two separate portions are to be distinguished; the shaft and the crucible or hearth, Fig. 1. The shaft is a cylindrical steel shell lined with fire brick, and fastened to an octagonal supporting ring, which bears on two built up beams, supported by the walls of the building. By this means the weight of the shaft and a large portion of the charge is carried, relieving the hearth roof of the weight. At the top of the shaft is a Tholander charging bell operated by a small motor; the object of this special bell being to deposit the ore and limestone round the walls of the shaft, and the charcoal in the centre.

The hearth resting on a concrete foundation, has a steel shell lined with firebrick, and an inner lining of magnesite brick. The basin shaped bottom is lined with a mixture of magnesite and tar, extending nearly to the top of the walls. The roof is of firebrick, and has openings to admit the electrodes. These latter are four in number, and pass through the roof at an angle of 65 degrees to the horizontal.

Electrode Adaption.

For the first six months this furnace ran with square, built up electrodes. Owing, however, to rapid development in the manufacture of large carbon electrodes, it has now become possible to obtain a round type of high electrical conductivity, 600 m.m. diameter. These have therefore been fitted to the Troll-

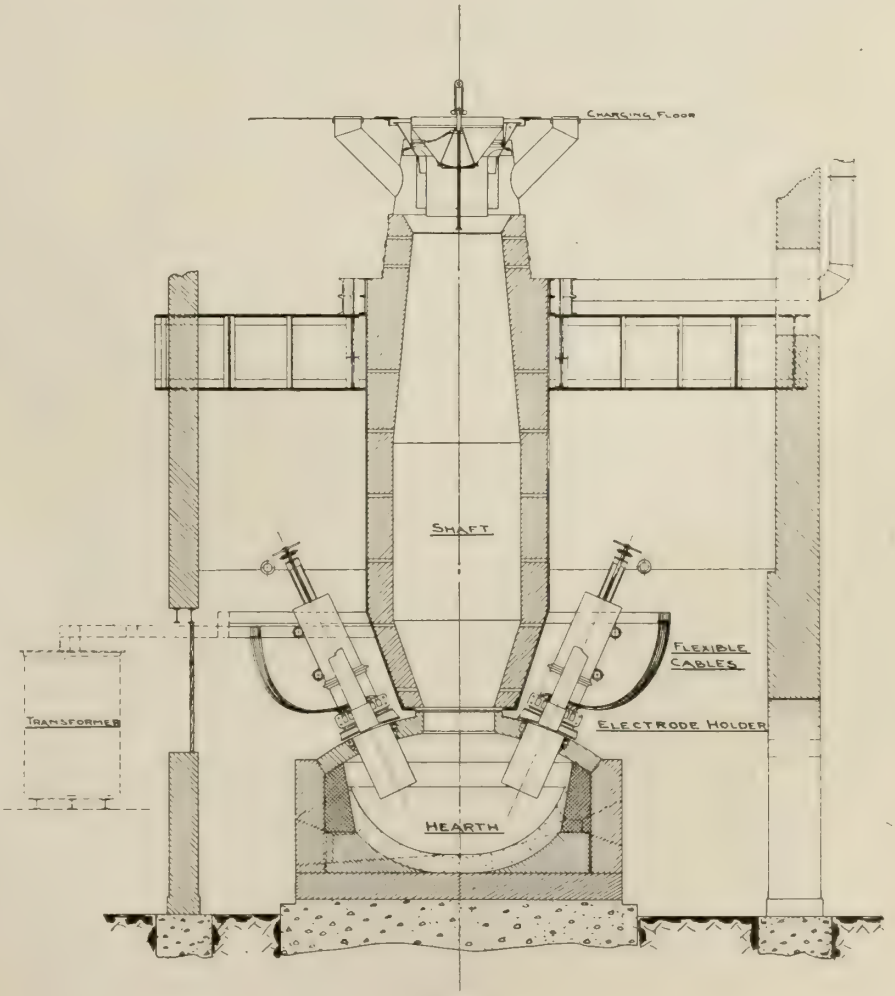


FIG. 1.

hattan furnace. The electrode holder was formerly at the top, but new holders are now fitted which grip the electrode at the point where it enters the roof. This reduces the electrical resistance losses to a minimum. Each electrode holder is supported on a frame which can be raised or lowered between two guides, by means of two long screws turned by a hand wheel. The round electrodes are fitted with screw joints, enabling a new one to be screwed on to the stump of the old, thereby doing away with waste from stump ends. Copper water jackets surround the electrodes at the point where they enter the roof.

Gas Circulation.

A novel feature of the furnace, is the circulation of the gas produced by the reduction. The cool gas from the top of the shaft is taken and blown by means of a fan through tuyeres under the roof of the hearth. This gas cools the roof and prolongs its life, at the same time becoming itself heated. It passes again up the shaft, and parts with its heat to the descending charge, thereby assisting materially in the reduction. The excess gas at present is allowed to turn into the air.

Dust catchers were used at first for cleaning the gas, but now a water scrubber has been installed, the arrangement of which can be clearly seen in the accompanying cut, Fig. 2.

General Features.

The low tension copper busbars are carried to the furnace by suspended insulated holders and the current is taken from the bars to the electrodes by means of flexible bare copper cables. The furnace is equipped with all necessary measuring instruments for temperature, pressure and gas analysis, and the instrument board has a complete set of electrical meters.

The smooth working of this furnace has been a feature from the very beginning. In most electric furnaces, the current is regulated by raising and lowering the electrodes, but in reduction furnaces working with gas pressure inside, this method is not practicable. In fact the electrodes are only lowered to adjust their wearing, this having only to be done about once every fortnight. The current is regulated by altering the primary windings of the transformers, and the arrangements are such, that the two phases can work simultaneously with different tensions.

The burden of the furnace was constantly altered during the first six months' working in order to obtain as much information as possible about its operation under varying conditions.

Large proportions of finely divided concentrates were at times used. As much as 65 per cent. caused no inconvenience in working. The shaft of this Trollhattan furnace is somewhat narrow, but with a wider shaft, it is expected that charges of all kinds will be smelted successfully.

Operation Statistics.

The following figures are averages for five months working from November, 1910 to April 1911 :—

Percentage of iron in ore ..	61.54
Percentage of iron in charge	57.00
Slag per metric ton of iron..	719.4 lbs.
Charcoal per metric ton of iron	793 lbs.
Time of working	3,348 hrs.
Time consumed in interruptions	153 hrs.
Total time	3,501 hrs.
Average load in K.W.	1,344
Total K.W.H. used	4,500,596
Iron per K. W. year (metric tons)	3.66
Consumption of electrodes per ton of iron	11.59

The gas produced is very rich, containing over 80 per cent. combustible. It was allowed to burn into the air at this plant, but arrangements are being made for its utilization in the various new plants being erected.

Steel Produced from Electric Pig Iron.

Most of the iron produced during the above period, was sent to various Swedish works and converted into steel in open hearth furnaces. These were both acid and basic, and tests on the steels produced, show them to be equal and in some cases superior to steels made from charcoal pig iron from the same ore. An interesting feature is, that low carbon pig iron made in the electric furnace can be successfully made into high quality steel in the open hearth furnace, with a considerable saving of time over ordinary pig iron. The Trollhattan furnace has used only charcoal as fuel, but four furnaces have been built in Norway which are working with coke. The coke furnace has a shaft with a smaller volume, greater diameter and less height than a charcoal furnace.

Gronwall Reduction Furnaces Working or in Course of Erection.

	E.H.P.
Sweden: Trollhattan (altered)	3,000
Domnarfvet, one furnace	4,000
Hagfors, two furnaces (3,000 H.P. each)	6,000
Norway: Tyssedahl, Hardanger two furnaces (3,500 H.P. each)	7,000
Arenal, two furnaces (2,500 H.P.)	5,000
	25,000

With the exception of Trollhattan, all the furnaces use 3 phase current and have six electrodes. Owing to the larger and better electrodes now obtainable, the writer is informed that it will now be possible to construct units up to 6,000 h.p.

Advantages of Electric Smelting.

One-third of the fuel required per ton of pig iron made in a blast furnace is used in the electric furnace, consequently only about two-thirds of the quantity of materials need to be handled. The pig iron produced is very regular in composition, as variations in the conditions due to temperature and humidity of the blast, and which cause trouble in blast furnace practice, are entirely eliminated. Owing to the basic lining of the furnace, very basic slag can be used, giving iron with low sul-

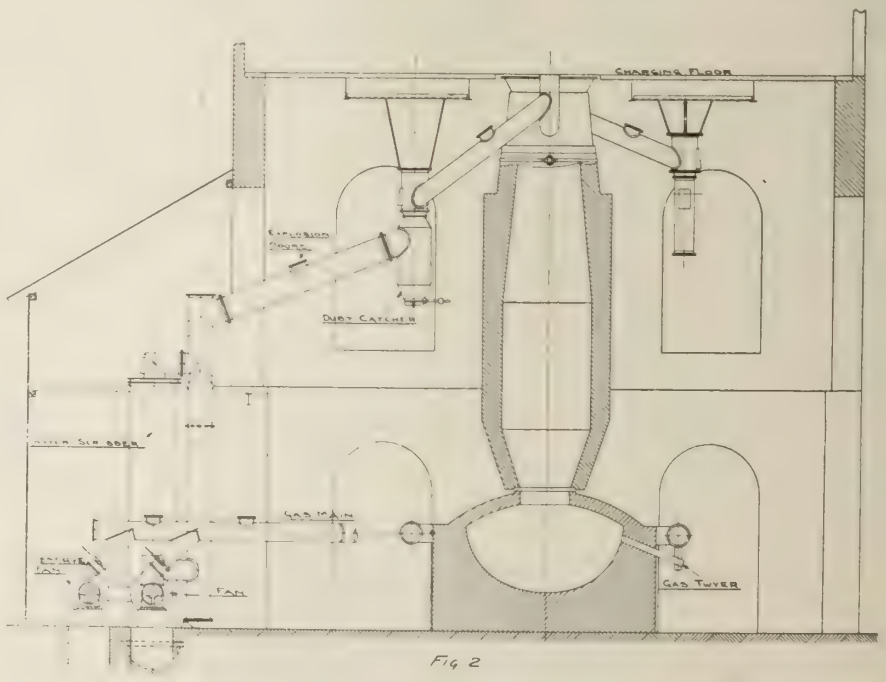


Fig 2

phur content. In fact ores high in sulphur can be smelted successfully, and which could not possibly produce marketable iron in a blast furnace. The electric furnace can smelt fine ores or concentrates without the expense of modulising or briquetting.

Cost of Production.

This varies in different localities. To make 3 tons of pig iron the electric furnace uses 1 ton of fuel (coke or charcoal) and rather less than 1 e.h.p. year. In the blast furnace, 3 tons of fuel are used to make 3 tons of pig iron.

The electric furnace, therefore, substitutes one e.h.p. year for two tons of fuel.

There are many localities having water power awaiting development, with iron ore close at hand. To many of these the freight costs for importing fuel make blast furnaces too costly, and into such places the electric furnace will come as the best apparatus for the profitable production of pig iron. It may be that it will be found better to convert the electric pig iron into high quality steel, rather than put it on the market as "charcoal" quality iron. This can very conveniently be done at the same plant. A large gas-fired metal mixer would be installed to take the molten iron from the shaft furnaces. It would be heated by the waste gas, which is very rich, and a considerable amount of refining would be performed in this mixer. The partially refined metal would then be poured into steel refining furnaces and treated so as to produce high quality steel of any desired composition.

Much progress has been made in the design of electric steel furnaces during the last few years, and one of the latest types of furnace to be introduced is the invention of the same three Swedish engineers, Messrs. Gronwall, Lindblad & Stalhane.

This furnace combines the advantage of most of the pioneer types, at the same time eliminating most of their weak points.

The Gronwall Steel Refining Furnace.

The main feature of this furnace is that it employs two phase current, and can utilize existing power supplies through static transformers, obviating the costly running plant necessary to transform three phase current for single phase furnaces.

Owing to the two phase arrangement of two electrodes carrying separate phases above the bath, and a neutral return embedded below the basic lining, the charge of molten metal is kept in gentle motion and the time for refining is reduced to a minimum. The reducing conditions which prevail at the end of the refining, produce a steel which is very sound when poured into ingots. From common raw material steel can be made of great chemical purity in a very short time. A Gronwall steel furnace, working in Sheffield, England, has produced tool steel by melting and refining old rail ends. This steel has been tested, and found equal to crucible cast steel, selling at $175 per ton. Using fluid metal as suggested above, a large output can be obtained, and with cheap power, the costs for refining would work out very small indeed.

In Sweden, some of the older firms, who have their reputations to consider, are pulling down their old plant and putting in electric furnaces. This they have done only after careful consideration, being naturally somewhat conservative. In Canada, there are ore deposits as yet untouched, there is water power awaiting development, and the demand for iron and steel in this growing country becomes greater every day. The days when electric smelting was in the experimental stage are over, and for Canada this question becomes one of national importance.

The Canadian Boving Co., 164 Bay street, Toronto, are the representatives of the foregoing equipment for the Dominion of Canada.

Success in Training Industrial Foremen*

By Charles F. Park **

The Writer Shows The Necessity There Exists for Greater Attention Being Paid to the Training of Industrial Foremen, and by Citing the Success of the Lowell Institute Course in This Field, Makes Clear That There is Not Only Necessity but Demand and Assured Success Awaiting Other Schools Who Care to Take it up.

WE are beginning to feel, that with all our efficient machinery and modern methods of manufacture, the absence of systematic training is placing our industries in a serious situation, and it has been stated, that "to-day we are reaping the sorry harvest of neglect." This condition is not only most unfortunate for the industries, but it is also deplorably unfortunate for the workmen.

Industrial Education Necessary.

What reason is there to expect that our untrained workmen will ever exercise any initiative, or that they can ever become leaders, even in a small way? How can they ever progress even from the smaller things to the larger ones, or how can they ever become qualified for positions of responsibility such as foremen, superintendents or shop managers? To be sure many men have developed under these conditions, but not because their work gave them proper training, but because they were naturally superior men. My appeal in this paper is for training that will develop the superior man, but I appreciate that there is also urgent need of industrial training for the great mass of ordinary workmen.

The superior man cannot get the desired training in the shop, and the lack of men able to carry small responsibilities or to fill the positions of greater responsibility, comes from the lack of training of the workmen themselves, and from whom we must select the leaders. Sound industrial education has seemed to several philanthropists to be the remedy.

A number of years ago Dr. Abbott Lawrence Lowell, the trustee of the Lowell Institute, foresaw the value of such training, and in 1903 he made a change in the work done by the Lowell Institute in connection with the Institute of Technology. The purpose underlying this change, as stated in an early announcement, is as follows:

Industrial Efficiency Dependent on Foremen.

We have heard a great deal in late years, of captains of industry; but the efficiency of the industrial art depends, in a very large measure, and probably to a constantly increasing extent, upon the capacity of its non-commissioned officers—in other words, upon the foremen. These men receive the same education to-day as the ordinary mechanic, and it has been thought that it would be a great benefit to the community at large if they could have some instruction in the principles of applied science, so that they might understand more thoroughly the work they are superintending, and be ready to apply improvements. It is felt, also, that a better educated class of foremen would be a benefit to the community socially, as an intermediary class between the employer or engineer on the one hand and the workmen on the other. To attempt, however, to train young men separately for the po-

* Abstract of paper presented before the Congress of Technology, at the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology.

** Associate Professor of Mechanical Engineering, Massachusetts Institute of Technology; Director of Lowell Institute School for Industrial Foremen, Boston.

sition of foremen would be under the existing organization of labor an impossibility. The foremen must continue, for the present at least, to be promoted from among the workmen. In giving them such an education as is desired, therefore, it is necessary to take men who are already working at their trade; necessary instruction can be given to them only in the evening.

School for Industrial Foremen.

With this object in view, it was decided to substitute for the advanced courses hitherto given by the Lowell Institute under the auspices of the Institute of Technology, an evening "School for Industrial Foremen," open free of charge, to young men who are ambitious and well-fitted to profit by the instruction. The term foremen is used in its broad meaning.

The school comprises two courses, one mechanical and the other electrical, and each extends over two years. The work of the school at the outset was practically the same as it is to-day. The courses are intended to bring the systematic study of applied science within the reach of young men who are following industrial pursuits, and who desire to fit themselves for higher positions, but are unable to attend courses during the day.

The schedule of courses is as follows, being for the mechanical and electrical, alike for the first year:

FIRST YEAR COURSE.

	Hours.
Mathematics	56
Physics	33
Electricity	28
Mechanism	34
Drawing	40
Total	192

SECOND YEAR MECHANICAL.

	Hours.
Elements of Thermodynamics, the Steam Engine and Boilers	38
Valve Gears	10
Applied Mechanics	38
Elementary Hydraulics	10
Testing Laboratory (Resistance of Materials)	12
Steam and Hydraulic Laboratory	24
Mechanism Design	12
Elementary Machine Design	60
Total	204

SECOND YEAR ELECTRICAL.

	Hours.
Elements of Thermodynamics, The Steam Engine and Boilers	38
Valve Gears	10
Steam Laboratory	16
Direct Current Machinery	12
Alternating Currents	22
Electric Distribution	30
Electrical Testing Laboratory	24
Laboratory of Dynamo Electric Machinery	48
Total	200

Evening Tuition and Work Undertaken.

It may be supposed that men who are following industrial pursuits during the day are not in a condition to receive instruction after their day's labor, and that the instruction under such conditions can be of but little profit; but it can be safely stated that such is not the case.

Some persons again have thought that the amount of work attempted in the two years was too large. To be sure, the courses are severe, and there are at present not a large number of men who are capable of following them; but the courses are not planned to reach the greater number of men. They are designed to give training to that group of picked men who are able to profit by the instruction, and who will be able through it to advance to higher positions. For the eight years of the school's history about as many men have been able to keep up with the work as the capacity of the school would admit. It is believed that with the facilities at hand, it is of greater value both to the men themselves and to the industrial community to give this high standard of training to a comparatively small number of men; training that will fit them for positions of foremen and superintendents, rather than to give training of a lesser degree to a larger number of students.

Attendance and Diversity of Occupation.

The average yearly attendance has been about 200 students, 125 in the first-year class and 75 in the second-year class. One hundred and eighty-nine men have graduated, and 30 of this number have attended the school a third year, and are graduates of both the mechanical and the electrical courses. The men have come from about 75 different towns within a radius of 20 miles, and a few from distant cities have taken up work in Boston, in order to attend the school.

A great variety of occupations have been represented, but about half the number of students are draftsmen or machinists. The oldest man to attend was 54 years of age, and the youngest 17 years. The average age of the students at the end of the first year course varied from 28 to 24. The average age of the graduates has varied from 29 to 25 years. A few men have graduated who were older than 40 years, and a number have graduated at the age of 19.

Early Educational Record of Students.

The earlier schooling of the men who have completed the first year course has averaged as follows:

College graduates, 4 per cent.
Attending college, 9 per cent.
High School graduates, 46 per cent.
Attending High School, 25 per cent.
Grammar school graduates, 13 per cent.
Attending grammar school, 3 per cent.

It will be noticed that, although a little more than one half the students have been High School graduates, or better, a considerable number of the men have entered the school with but very little earlier schooling.

Success of the Scheme.

That the school is making men more efficient in their regular occupations, and qualifying them for advancement along the lines in which they are working, has been demonstrated by the graduates. Nearly all of these men have changed their occupations, or have advanced to a higher grade in the same line of work.

There are but few exceptions to the rule that a good workman gets better pay than a poor one. The following facts have been compiled from answers to a circular letter received from about three-fourths of all the graduates:

Average Increase of Salaries.

Two years after graduation, more than 70 per cent.

Class graduated in May, 1910, 72 p.c.

From three to six years after graduation, 107 per cent.

A considerable number of graduates have received increase of salaries greater than 200 per cent., several men have received more than 300 per cent., and one man had an increase of 450 per cent.

A LARGE INGOT.

An ingot weighing 130 tons, probably the largest ever produced in the United Kingdom, has been cast by Cammell, Laird & Co. at their Grimesthorpe Works, Sheffield. It was over 15 ft. long. At one end it measured 9 ft. by 4 ft. 9 in. and at the other, 9 ft. 3 in. by 5 ft. After being slabbed down to about 3 ft. 6 in. thick, which process reduced the weight to around 90 tons, it was then rolled into a mild steel plate. The rolling operation was carried out in the armor-plate mill, which is believed to be the largest and most powerful in the world, and is operated by engines of 12,000 h.p. When the job was completed, the plate measured 18 ft. 6 in. long, 10 ft. 9 in. broad, and 25 in. thick.

R. E. Smythies, who recently arrived in Canada from England has taken a part interest in the Boiler Repair and Grate Bar Co., 69 Adelaide Street, Toronto. The office department will be in his charge, while that of the boiler and grate bar departments will be attended to by A. H. Hett, and J. E. Taylor, respectively.

Not often does the public have the opportunity of hearing some of the great men of the country talk and spin yarns in their leisure moments. A newspaperman was in the Mount Royal Club the other night and happened to be able to get a little group of old railway pioneers together—men who are now financial forces in Canada. One of them, whose name has to be witheld, but who used to be "The Assistant Engineer" out in the Rockies when the C.P.R. was built, tells a tale about himself and a horse—a yellow horse—which is really worth reading. It appears in MacLean's Magazine for August.

Description of the Electric Method of Spot Welding

By Halyard

This Article Gives a Brief Illustrated Description of the Theory and Principle of Electric Spot-Welding, Its Practical Application and Most Suitable Material Thicknesses Treated, Its Strength Compared With Riveted Work, Together With Examples of Tests and Equipment Details. Those Engaged in Sheet Metal Work Will Find the Data Instructive.

THE theory is as simple as its application, and is an adaptation of the well-known principle that a poor conductor of electricity will offer so much resistance to the flow of the current that it will heat, the degree of heat depending on the amount of current and the resistance of the conductor. An incandescent lamp offers a good illustration of this principle. The copper wires leading to the lamp are good conductors and remain cool, but the carbon filament, being a poor conductor, becomes white hot, or reaches a state of incandescence.

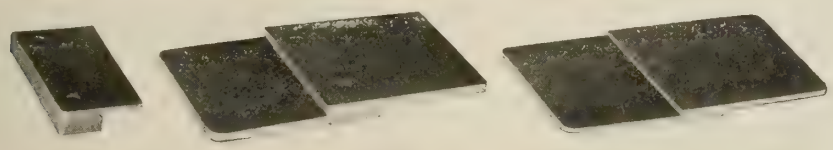


Fig. 1.

Process and Examples.

In spot welding a large volume of current at such low voltage or pressure that it cannot be felt by the bare hand passes through a pair of copper die points; two pieces or more of sheet steel are placed between these points and when the current is turned on with the switch, the pieces of steel offer so much resistance to the flow of current that they instantly become hot at the point opposite the copper dies. The hotter the steel becomes, the greater is the resistance, and automatically the current is forced into the adjacent cooler parts until all the metal in proximity to the dies is brought up to the welding temperature, when a slight pressure on the lever handle mounted on the machine forces the molecules of molten metal together and they are completely and perfectly united. This is done in an incredibly short space of time, taking only a fraction of a second when stock as light as 20-gauge is to be welded. In actual practice one of the copper dies only is pointed and the opposing one is flat. The pointed die leaves a slight indentation on one side of the metal, and the opposite side is perfectly smooth. This is shown by the cut Fig 1, where both sides of a piece of sheet steel and a light piece are welded to a heavier piece.

Examples of Spot Welding.

Fig. 2 shows six pieces of sheet steel of varying thicknesses welded together at one time; also two pieces torn apart near the weld. The metal has been absolutely fused together, and cannot be pulled apart.

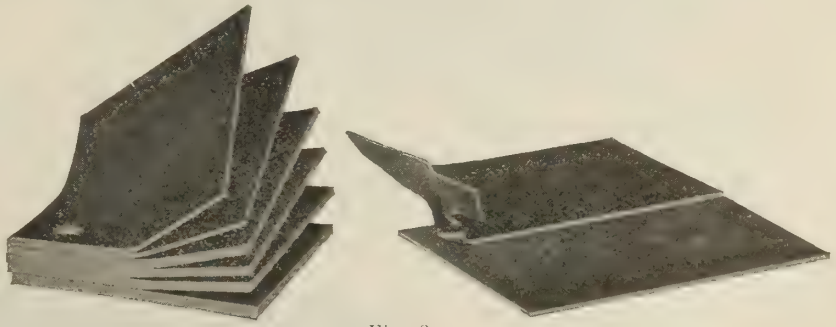


Fig. 2.

Fig. 3 shows front and back view of a spot-welded piece, as also a photographed sectional view of a spot-welded and riveted piece of metal, which illustrates forcibly why the latter will not stand within 60 per cent, as much of a strain as the former. The metal is punched out in the riveted piece, thus weakening it at that point, whereas the spot-welded piece is fused together at the point where the slight depression is seen, making there a complete union of the particles of the steel. A piece of galvanized iron is also shown, and which has been hammered until the metal was torn out in attempting to break the weld apart.

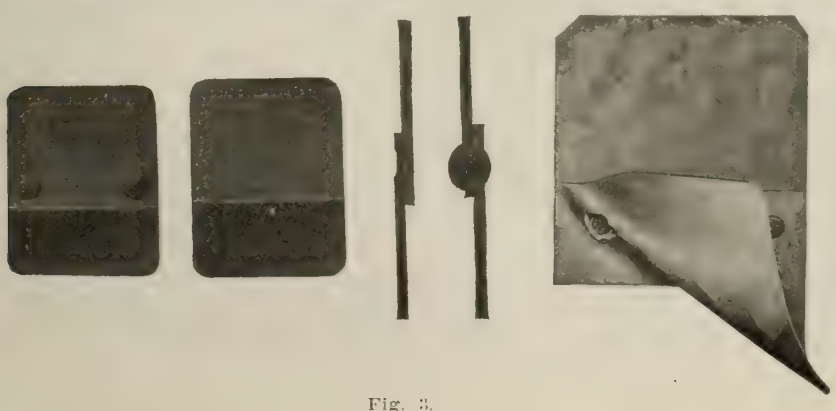


Fig. 3.

Fig. 4 shows a foot-operated spot welder. When the foot lever is pressed down the dies are brought together to clamp the stock, and a slight pressure with the heel on the outside pedal turns on the current to complete the operation. Where it is necessary to have the use of both hands in placing the stock in the machine this type of welder possesses many advantages over the hand-operated machine.

Fig. 5 illustrates a machine especially adapted for stove and sheet metal work. With the extended horn, almost any part of a range can be welded without difficulty.

How to Operate.

Place the stock between the two copper die points.

Pull down on the lever handle to clamp the stock in position.

When ready, touch the switch with the thumb—let go—the job is finished quicker than one can tell about it.

The electric current jumps through the sheet iron and fuses or melts the metal at a point or spot the size of a rivet.

Fig. 6 shows the stove welder described above, with the different parts of the machine plainly marked. The special transformer in the welder is used to reduce the 220 or 440 volts to the

3 to 5 volts used in making the welds. This diagram shows that no auxiliary devices of any kind are required and clearly illustrates the simplicity of the apparatus.

former required in the welder when less than 60 cycles are used, an additional price is charged for welders operating on 25 to 40 cycles. The power factor varies from 70 to 85 per cent., according to the



Fig. 4.

Convincing Test of Electric Welding.

Ten specimens of hoop steel were subjected to a test at the Lunkenheimer laboratory in Cincinnati, with the following result. All pieces were of the same size—1.12 in. by .035 in. Examining this test carefully it will be noted that on

Test No. 1—One spot weld broke at 1,625 lbs.

Test No. 7—One rivet broke at 990 lbs.

Test No. 9—Two spot welds broke at 2,275 lbs.

Test No. 2—Two rivets broke at 1,555 lbs.

Test No. 3—3 spot welds broke outside of the weld at 2,715 lbs.

Test No. 4—3 rivets tore apart at 2,055 lbs.

Current Requirements.

Single-phase alternating current must be used in electric welding. Where two or three-phase current is available, use only one-phase of the multi-phase system. Any voltage from 110 to 500 can be used, but 220 or 440 is preferred, as it is more nearly standard than any other, and all stock machines for quick delivery are arranged for 220 volts. Any frequency from 25-cycle to 140-cycle can be used, but owing to the larger trans-

work, and the way that it is handled. Inside the welder and part of it, is a special transformer to reduce this outside current to the 3 to 5 volts used in making welds. This is so low that it cannot be felt by the bare hand and explains why it is absolutely safe for the operator, as he cannot by any possibility feel the current.

Cost of Current.

Based on current costing 1c per k.w. hour, it will cost from 1c to 3½c per thousand welds. If current costs 3c or 5c, multiply the price given below by the rate charged by the lighting company, to give the actual cost per thousand welds.

Welding Data.

Gauges of Sheet Steel	Thickness in Fract. of inch.	Thickness in Dec. parts of inch.	Approx. K.W. Cap.	H.P. at Dynamo.	Time in sec. to weld.	Cost per 1,000 weld at 1c K.W. cts.
10	9-64	.140625	18	25	1.5	3½
12	7-64	.109375	16	23	1.3	3
14	5-64	.078125	14	20	1	2¾
16	1-16	.0625	12	18	.9	2½
18	1-20	.05	10	15	.8	2¼
20	3-80	.0375	9	14	.7	2
22	1-32	.03125	8	13	.6	1¾
24	1-40	.025	7	11	.5	1½
26	3-160	.01875	6	9	.4	1¼
28	1-64	.015625	5	8	.3	1

No preparation of stock is required unless it is very rusty or scaley; in which case it will be found economical to clean off the rust or scale, as more current is used than on clean stock. Based on using fairly clean stock, the above table will give an idea as to the time and current required in welding different gauges of sheet steel.

Welding Limitation.

There is a limit to the thickness of sheet metal that it is practical to spot weld. This is due to two causes, 1st, the fact that the copper rods which conduct the electric current can only carry a certain quantity of current without excessive heating. When sufficient current is carried over these copper rods or

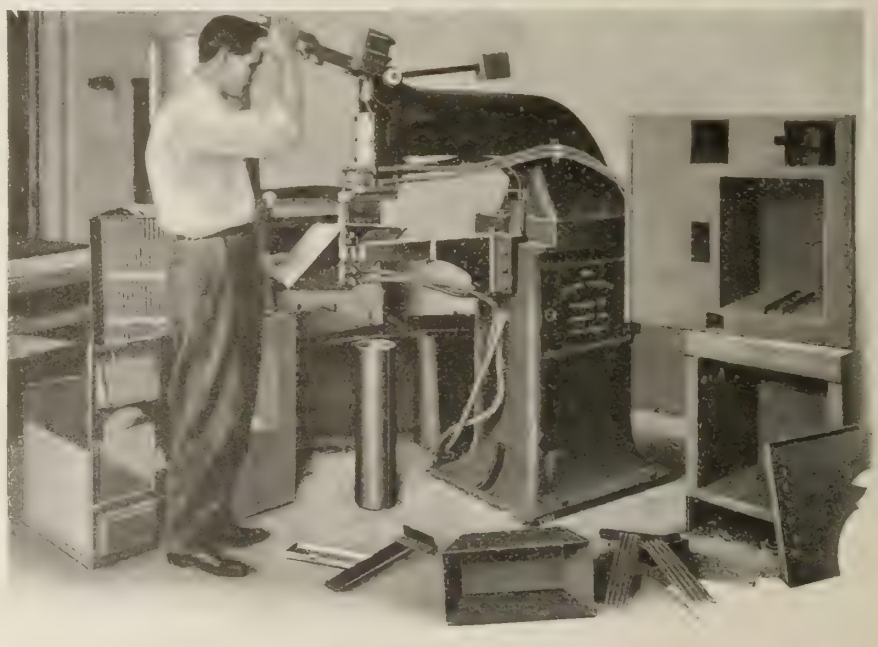


Fig. 5.

die points to bring very heavy metal between them up to the welding temperature, the copper rods will become so hot they will soften and the points wear away so rapidly that it is not practical to use them for this kind of work. 2nd, It is necessary to have the two pieces of metal touch each other at the point where the weld is made. With very heavy stock, a slight kink or buckling of the metal will prevent the flat surfaces from making good contact. Stock as heavy as 3-16-in. or ¼-in. can be welded, but the best results are obtained when ⅛-in to ⅛-in. or lighter are welded.

Copper and brass cannot be spot welded for the reason that they are both good conductors of electricity and offer no resistance to the flow of the current. It is impracticable to weld cast iron, as there is no fibre to stock of this kind and the metal will tear out at the welded spots. Galvanized iron can be welded, although it will burn off the zinc, leaving the iron exposed at the point where the copper dies come in contact with the metal. Heat has no effect on the electric weld, and for this reason this process is largely used by stove manufacturers in making sheet steel ranges and similar work. It is not practical to make more than one spot weld at a time, as it is almost impossible to make a number of die points bear on the stock with equal pressure, and the one die point making the best contact will carry all of the current, and the result will be that with so much current concentrated at this point the metal is liable to be burned. The machines used for this work can be furnished either hand-operated, foot-operated or power-driven. A depth of throat can be furnished from 6 to 48 inches, and a variety of types are made to suit almost any kind of sheet metal work where rivets are used. The "Toledo" Electric Welder Co., of Cincinnati, Ohio, are the manufacturers of these machines and their catalogue shows a number of different types adapted to this class of work.

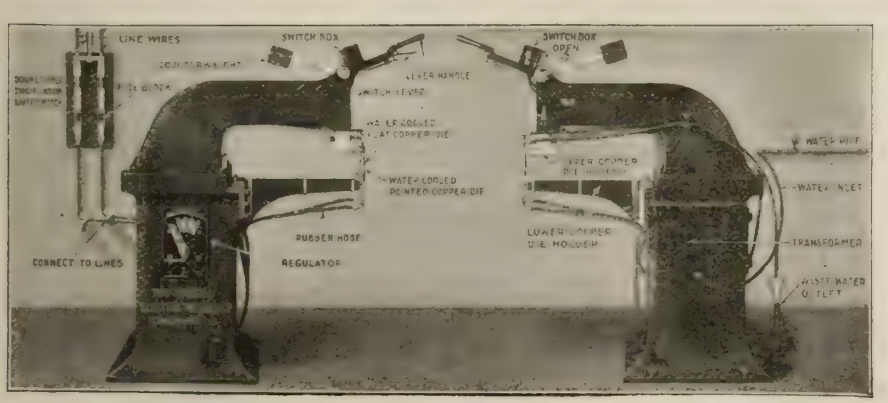


Fig. 6.

Standardizing Equipments and Fits

By Harold Smith, Toronto

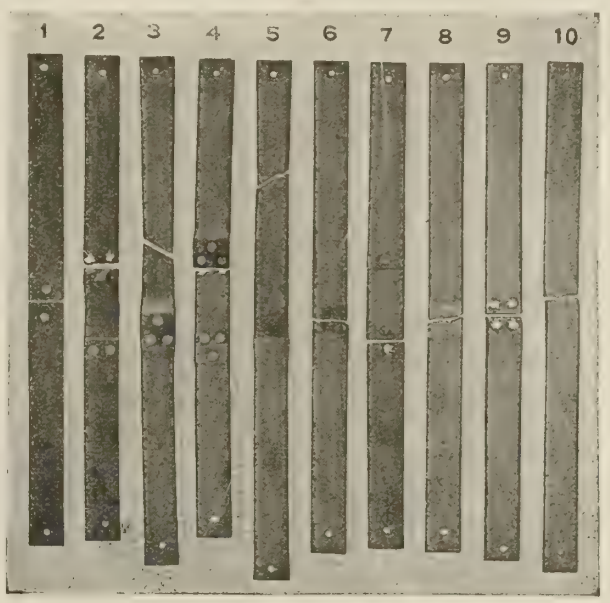
This Article is the Second of the Series; the First having Appeared in our July Issue. The Writer is an Expert on Standardization Work, and Consequently Speaks with Confidence, Born of Experience. Machinery Manufacturers, on a Large or Small Scale, will find the different Subjects Treated, Both Interesting and Profitable.

IN a recent paper on the manufacture of large gas engines, it was said that:—"To design without reference to the machine tools available is an easy matter, assuming the necessary tools to be specially constructed for your purpose. Such a design although possible, and at the same time good, would mean more costly manufacture, because of increased capital outlay for such tools, unless a very large output could at once be obtained to enable them to be fully worked.

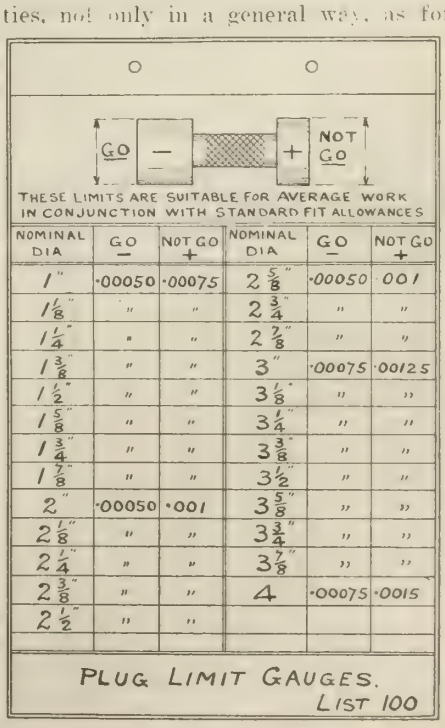
A really successful design is one that employs a range of standard machine tools in a particular workshop for the whole of their time at economical speeds of working, and produces a high-class engine with the largest output and lowest capital cost."

Shop Practice and Design.

This is true of all machine shop work, and necessitates designers becoming more and more intimate with all details of their firm's shop practice and possibilities, not only in a general way, as for



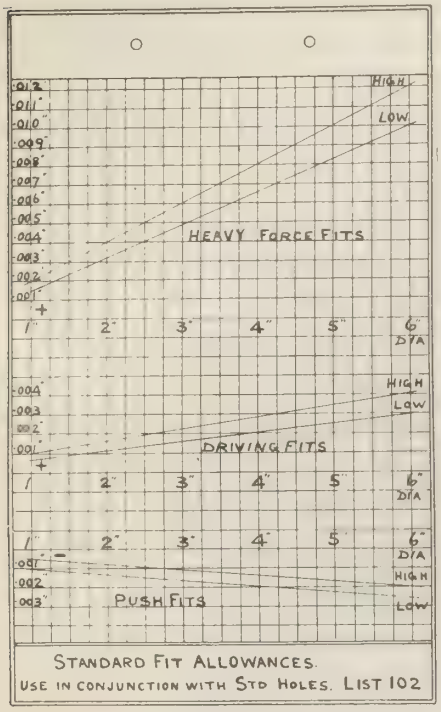
Electric Welding Test Specimens.



NOMINAL DIA	GO −	NOT GO +	NOMINAL DIA	GO −	NOT GO +
1"	·00050	·00075	2 5/8"	·00050	·001
1 1/8"	"	"	2 3/4"	"	"
1 1/4"	"	"	2 7/8"	"	"
1 3/8"	"	"	3"	·00075	·00125
1 1/2"	"	"	3 1/8"	"	"
1 5/8"	"	"	3 1/4"	"	"
1 3/4"	"	"	3 3/8"	"	"
1 7/8"	"	"	3 1/2"	"	"
2"	·00050	·001	3 5/8"	"	"
2 1/8"	"	"	3 3/4"	"	"
2 1/4"	"	"	3 7/8"	"	"
2 3/8"	"	"	4	·00075	·0015
2 1/2"	"	"			

instance "What the big lathe will swing," but in absolute detail, as to minor equipment, such as drills, taps, milling cutters, reamers, boring bars and cutters, arbors, etc.; such information being kept in mind by means of standard lists.

It is obvious that the shop and drafting room must work hand in hand in



STANDARD FIT ALLOWANCES.
USE IN CONJUNCTION WITH STD HOLES. LIST 102

this matter, and to a certain extent predetermine what equipment it is advisable to carry in tool stores, to handle their particular business in the most economical way, and so that the right minor tools will always be ready for use. This is of course a simple matter, where only special lines or styles of machinery are manufactured, and where equipment is specially designed for the purpose. Where a general business is carried on, the matter is more complex, but this is now being solved to a considerable extent by standardization of parts, machine operations and equipment, as also by the embodiment of certain definite principles in design.

Standard Holes.

It should be insisted that holes are kept standard size and outside diameters made large or small to suit the class of fit. There is no difficulty in doing this where both hole and outside diameter are to be machined, and in cases where it would seem more economical to reverse this rule (as for instance where cold rolled steel shafting is used), it can be overcome by designing with some small amount of machining. Moreover, most manufacturers of cold rolled steel make their product a few thousandths small (about .001 inch for each 1 inch diameter) for push and running fits, and any press fits required, can be obtained by slightly reducing the diameter in the lathe or grinder to the next nominal dimension, e.g. from 1 15-16 inch to 1⅞ inch plus the press fit).

The importance of standard holes cannot be too strongly emphasized, as it enables the shop for quite a reasonable outlay to have reamers, boring cutters and boring bars standardized for different sizes of hole and always ready for use, no matter what shape of article is to be tooled, so long as it is a boring job. By keeping holes standard, reamers can be used on almst all work, which means that accurate boring can be produced at a commercial cost which is not attainable with a bar and point tool. It may be claimed that with adjustable reamers, the diameter can be made large or small to suit, but this adjustment is a continual expense, and the tool when required by the lathe hand will never be ready for use, causing him delay and eating up any possible saving. The object of the adjustable feature is to take up wear, and not to cover a range of diameters.

Again, with standard holes, gauging and testing can be accurately done by plug limit gauges, to a degree impossible with the single standard plug gauge, which, if a hole is to be made small, we cannot tell just how small, as the gauge will not enter. If standard, and lathe hand allows it to just enter, we know it must be a little oversize at the mouth, and probably tapers further up. If oversize, the gauge goes in, the amount of excess is estimated by the feel, and therefore not in any positive manner.

The limit plug gauge, on the other hand, tells at once that the hole is commercially accurate within certain necessary limits and without any personal errors from judgment or touch. There will be one definite gauge for each definite hole. Standardization of holes therefore means that for quite a reasonable outlay, the shop is prepared to handle either small or large lots of boring and chucking work in an accurate and economical manner, and that even turret lathe equipment which smacks of specialty, is always ready for use and possesses a degree of flexibility comparable with the simpler but less productive engine lathe.

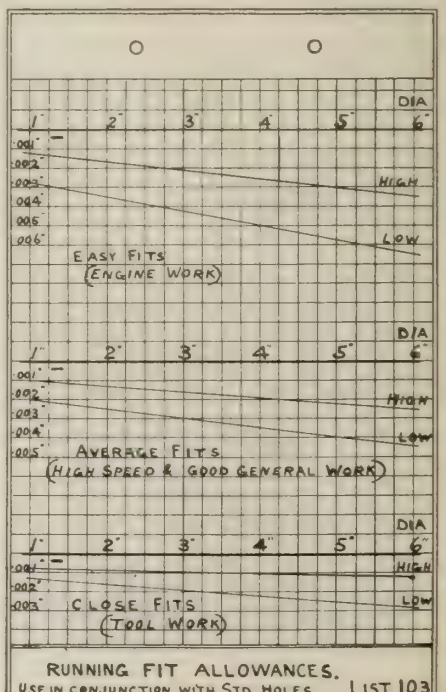
Machine Tool Standardization.

Standardization can be introduced into the machine tools themselves. The spindle noses of lathes can be re-threaded to be same pitch for same diameter, so that chucks will fit any lathe. Where this change is not possible, adapter plates can be made. The taper holes in milling machine spindles as produced by different makers are not always the same standard; more particularly is this true of older machines which were made Morse, as against present Brown & Sharpe. They should be re-reamed to fit standard arbors. All this means a smaller outlay in minor equipment, to supply quite a number of tools which may be employed on a variety of work coming through in small quantities.

The variety of sections of tool steel for lathe and planer tools can often be reduced by modifying the tool posts somewhat, so as to take predetermined standards, thus reducing the stock of idle tools and tool steel, which is no small item when of high speed quality. The common practice of stocking lathe, planer and shaper tools of standard types, all ground to correct angles is a step in the same direction.

It should be appreciated that accuracy and a definite commercial cost are the objects aimed at, and that there are exceptions to all rules. Clearance holes must not be confounded with fits. A gland for instance has a clearance hole, and as commercial accuracy say for a 2 inch. nominal diameter is satisfactory if within .0025 over and .0015 under; giving a margin of .004 inches. A coupling forced on to the same shaft for a press fit would have to be not more than .001 inches over, and not less than .0005 inches under, giving a margin of only .0015 inches. Commercial accuracy is a varying quantity.

Where rougher work is allowable, it is quite possible that it may be in some cases cheaper to break away from these standards, but as the modern tendency in machinery design is to reduce clearances and increase speeds, this demand for accuracy (which competition demands shall be produced at low costs) is growing stronger every year, and the manufacturer who is turning out but one



RUNNING FIT ALLOWANCES.
USE IN CONJUNCTION WITH STD HOLES. LIST 103

class of goods will be compelled to keep his costs down by adopting some method of standardization.

The foregoing is a mere outline of methods successfully adopted. Each shop has its own peculiar problems, and is best in a position to solve them, and though the details will differ in every case, yet the principle judiciously applied, holds good for all.

Fit Allowances and Standard Hole System.

The accompanying cuts show details of average fit allowances, based on a system of standard holes. It will be noted that the impossibility of absolute accuracy is appreciated throughout; limits between which it is commercially possible to produce work accurate enough for a particular class of machinery, being specified. Thus, (list 100) for a 3-inch fitted hole, the work is considered a good job, if not more than .00125 inch. larger than standard, or more than .00075 smaller, giving a total working margin of .0005 inches. The— GO. end of the gauge is allowed to enter, and the + NOT GO, not allowed. As the — GO. end thus necessarily gets the wear produced from usage, it is made the longer, and this difference of length also serves as a ready means of distinguishing the two ends, when gauging.

Lists 102 and 103 show allowances and limits on external diameters for different fits. When allowance is above the line +, the finished diameter is larger than standard, requiring force to drive it home into a hole. When below the line —, the finished diameter is less than standard, making a push or running fit. Here again, limits "high and low" are specified, between which work is commercially accurate for different classes of machinery. Thus, a 4 inch running fit for engine work, should be between .0024 and .005 inch small, giving a working margin of .0025 inch. The same fit for tool work should be between .001 and .002 inch, giving a working margin of only .001 inch. Locomotive work again, would require a different scale.

Recent Drilling Records

AT the recent joint conventions of the Railway Master Mechanics and Master Car Builders Associations held at Atlantic City, June 14th-21st, 1911, much interest was aroused by some phenomenal results obtained in a demonstration test of twist drills. As the durability and efficiency of tools are such important factors in economical production, these results should be welcomed by all interested in this subject.

Test Results.

The Cleveland Twist Drill Co., of Cleveland, had a Foote-Burt No. 25½ high duty drill press in operation in connection with their exhibit, and the results obtained from tests of Cleveland milled and flatwist drills taken from stock, are tabulated below:—

Size and Kind of Drill	Material	R.P.M.	Feed per Rev.	Inches Drilled per Min.	Peripheral Speed in ft. per Min.	Cu.In. Metal removed per Min
1¼ Paragon	CAST IRON 3½ inches thick	500	.050	25	163.6	30.68
1¼ "		325	.100	32½	106	39.88
1¼ "		475	.100	47½	155	58.29
*1¼ "		575	.100	*57½	188	70.56
1½ "		300	.030	9	117	15.90
1½ "		325	.100	32½	127.6	57.43
1½ "		335	.100	33½	131.5	59.19
1½ "		355	.100	35½	139.4	62.73
1⅞ "		235	.100	23½	107.6	56.52
1⅞ "		350	.100	35	160	84.19
2 5-16 "		190	.050	9½	115	39.90
3 "		120	.100	12	94	84.82
1¼ "	MACH. STEEL 4¼ inches thick	350	.030	10½	113.7	12.88
1⅝ "		225	.040	9	94.8	18.66
2 5-16 "		165	.020	3¼	100	13.65
2 5-16 "		200	.020	4	121	16.80
2½ Milled		150	.015	2¼	98	11.04
2½ "		150	.040	6	98	29.45
2½ "		175	.040	7	115.5	24.36
1¾ Paragon		275	.030	8¼	125	19.84
3 "		150	.030	4½	117.8	31.81
3¼ "		150	.030	4½	127	37.33

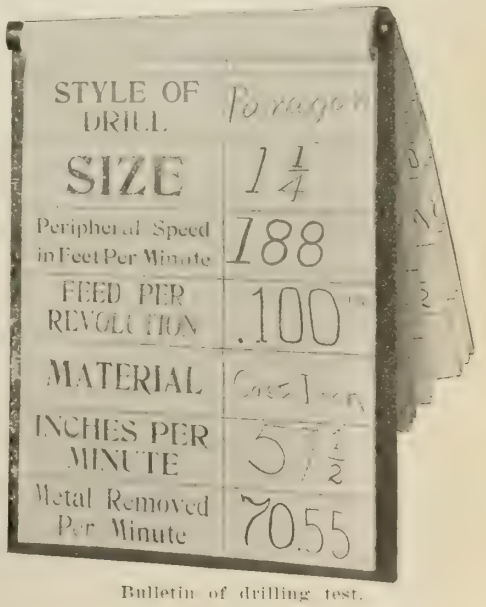
*This is the highest drilling speed on record.

Official Record of the Tests.

The first tests made were for the purpose of demonstrating what is good shop practice, i.e., the drills were put through at speeds and feeds that would be economical under average shop conditions. Then, to demonstrate the reserve efficiency and durability of the drills, "stunts" which demanded extremely high rates of speed and feed, were attempted. The highest rate of speed in drilling known to machine shop practice was attained by a stock 1¼ inch Paragon flat twist high speed drill in successfully removing 70.55 cu. in. of cast iron in one minute, repeatedly cutting through a heavy billet at the record-breaking rate of 57½ inches per minute or nearly an inch per second. This drill ran at 575 r.p.m. with 1-10 (.100) in. feed per revolution, successfully withstanding the great strain of this extreme speed, and feed. Before attaining this maximum performance, which was approached gradually, numerous other "Cleveland" Drills were put through at the rates of 25, 32½, 33½, 35 and 47½ inches per minute. In no case was the limit of strength of the drills reached, although the speed of 57½ inches per minute could not be exceeded, on account of the inadequate capacity of the electric feed wires, which brought current to the motor driving the drill press.

Drilling at such high speeds and heavy feeds is not to be recommended as economical shop practice, and this performance will in all probability not be repeated in many shops. These results were only made possible by carefully established ideal conditions, such as:—absolute rigidity in the machine, uniform and sufficient driving power, solid clamping of the work, perfect grinding of the tool and most expert handling. They are of value chiefly, as demonstrating the power and rigidity of the machine, and the exceptional reserve strength of the drills.

Another noteworthy test was made with a 2½ inch. milled drill from stock. It drilled 68 holes through a billet of machinery steel 4¼ inch. thick, without being reground, and was operated at 150 r.p.m., with a feed of .015 per revolution, removing a total of 1418 cu. in. of material. Although the drill was still in good condition, the test was cut short at this point by the convention coming to a close, yet there was demonstrated what can be done all day long in any shop properly equipped, and indication given of what results may be expected in economical high speed drilling.



Bulletin of drilling test.

The Apprentice Question

SPEAKING at the eighth annual convention of the Master House Painters' and Decorators' Association of Canada, held recently in Toronto, W. E. Wall, Somerville, Mass., said that now-a-days the average master mechanic is unwilling to reach his trade; a contingency largely due to his time being fully occupied in other directions. The tendency, therefore, is for the apprentice to be left in the hands of underlings, whose knowledge at the best is somewhat superficial. The day is long since past when master and men worked hand in hand. Numbers of young men who desire to learn a trade are thus unable, and drift into the already overcrowded unskilled labor market.

Comparatively few of those who pass through the High School, go on to college, yet all receive a training which is of a preparatory nature, and which does not benefit them in the least. As a result, large numbers of High School graduates may be found to-day, holding down jobs which could be filled equally well by men who had received only an elementary training.

To show the difficulties which confront the would-be apprentice, Mr. Wall cited an instance which had come to his notice, of a lad who, wishing to learn harness-making, had tried vainly for a long time to become apprenticed, and finally committed a slight crime so that he could be sent to a reformatory where the trade was taught.

Trade Schools the Remedy.

Having pointed out the difficulties which beset a young man, the speaker entered a most emphatic plea for the trade school. He suggested that manual training should begin in the primary school, so that by the time the child reached an impressionable age, he should have had an opportunity to show adaptability for some particular art or trade, in which he might receive further instruction at the High School, and later in a Special Trade School. It is a well-known fact, said Mr. Wall, that America which is one of the greatest mechanical producers, cannot produce mechanics, and that the majority of the foremen in mechanical factories in the States are men who have been trained in England or Germany.

Benefits Assured.

In conclusion, Mr. Wall said that one year in a Trade School would be of more benefit to a lad than two under the apprenticeship system, for there would be nothing to detract the learner's attention from his work, while the instructor would be unhampered by the commercial considerations which must needs affect the master mechanic, and so would be able to give his undivided attention to the training of his students.

Spur Gears

By G. D. Mills, Montreal.

IN the design and layout of spur gears, it often becomes necessary to calculate the strength of the teeth. As the Lewis formulae takes account of so many variable conditions, they may be safely used for that purpose, and are as follows:

Mr. Lewis gives three formulae for determining the value of "y"; see Kent's pocketbook, page 902. The values in the table on the preceding page, are however, evidently obtained from a plotted curve.

Lewis' and Flanders' Formulae.

In the proceedings of the American Society of Mechanical Engineers Vol. 30, 1908, a very able review of the subject is given by Mr. Flanders, in which he compares the values obtained originally by Mr. Lewis, with his own in a plotted diagram. The increase he obtains being accounted for, by reason of the fact, that he has lengthened the rack tooth a distance equivalent to the clearance, and strengthened the corners by a fillet, whose radius is equal to 2-3 of the clearance. This may be considered an improvement, in keeping with the demand for a strengthened tooth. Mr. Flanders' values are obtained from the original formula $W = \frac{s.f.y.}{P}$, in which "P" is the diametral pitch, "y" equal to 3.1416×"y" in the Lewis formula, and "f." "s." the same as the Lewis values. The tooth parts also correspond to those given in this article.

In order to embody here the results obtained by Mr. Flanders, which, by the way, are endorsed by Mr. Lewis as an improvement, I have divided Mr. Flanders' values by 3.1416, to make them correspond to the Lewis formula, and have obtained the two equations by which "y" is determined for 20 degrees and 14½ degrees obliquity. The table of constants "y," and also the equations, therefore, differ slightly from those originally published. Respecting the safe working speed stress, the values in the table are evidently obtained from plotted

LEWIS FORMULA.

$W = s\ p\ f\ y$

W = safe load in lbs

s = safe working stress of material in lbs "see table of stresses"

p = circular pitch

f = face length of teeth

y = constant from table of constants "y"

$y = .149 - \frac{.776}{n}$ for 20° obliquity involute

$y = .139 - \frac{.737}{n}$ " 14½° " & cycloidal

n = number of teeth

$Horsepower = \frac{W\ v}{33{,}000} = \frac{s\ p\ f\ y\ v}{33{,}000}$

v = velocity in feet per minute

$v = \frac{D \times 3.1416 \times rpm}{12} = D \times .2618 \times rpm$

D = pitch diameter in inches

rpm = revolutions per minute

"LEWIS" Constants "y"

number of teeth	20° Involute	14½° Involute & Cycloidal
12	.084	.077
13	.089	.082
14	.093	.086
15	.097	.090
16	.101	.093
17	.104	.096
18	.106	.098
19	.108	.101
20	.110	.102
21	.112	.104
23	.116	.107
25	.118	.110
27	.121	.112
30	.123	.115
34	.126	.117
38	.129	.120
43	.131	.122
50	.134	.124
60	.136	.127
75	.139	.130
100	.141	.132
150	.144	.134
300	.146	.136
Rack	.149	.139

curves, derived from the formula, $S = \frac{600}{600 + \text{velocity in feet per minute}}$. It will be noticed that the quantities .139 and .149, are the rack values for "y" in the table, and the value of "y" for any number of teeth not tabulated may be readily determined.

Spur Wheel Design

Spur gears form the greater part of all machine gear drives, and are usually arranged in pairs, and in groups, to transmit the required speeds and horsepower. The calculations which are necessarily a part of the design of a box or group of gears are usually extended, and often include the diameter of cone steps, controlling mechanism, etc. While it is not the intention to introduce in this article the principles of group design, we shall, however, consider the design of a pair of wheels, which are required to transmit 3 horse power, and have a speed ratio of 3 to 1. The driving shaft makes 40 revolutions per minute, the gear or larger wheel is to be the driver, and the distance between centres is, say, 6 inches. By referring to the Lewis formula, we find the horsepower $= \frac{W.V}{33{,}000}$.

$W = \frac{(D \times .2618 \times \text{r.p.m.}}{33{,}000}$, therefore $3 = \frac{W(D \times .2618 \times \text{r.p.m.}}{33{,}000}$. Determining the velocity, we have the revolutions per minute, the pitch diameter, which can be calculated from the distance between centres, and the speed ratio.

Pitch diameter of Gear $= \frac{C}{R+r} \times r \times 2 = \frac{6}{1+3} \times 3 \times 2 = 9$ inches, therefore, $3 = \frac{W.(9 \times .2618 \times 40.)}{33{,}000} = \frac{W \times 94.248}{33{,}000}$, from which equation we may write the proportion, 3:W: : 94.248 : 33,000. The value of three terms being known, the remaining term "W" $= \frac{3 \times 33{,}000.}{94.248} = 1050$ lbs.; in other words, the load which the wheels will labor under, to transmit 3 horse power. If we decide to make the wheels of cast-iron, we have one of the components of this load, the value of "s" for a velocity of 100 feet per minute or less. As W=s.p.f.y.=8000×p×f×y, the value of p, f, and y. can be determined from a selected diametral pitch.

In the table of tooth parts will be found a column of circular pitches for each diametral pitch, and also a column of face lengths, the latter being calculated in even lengths of about 2½ times the circular pitch. Selecting in this case, 5 diametral pitch, "p"=.6283 and f= 1 9-16 inches. The number of teeth by which to determine the value of "y," can be found from table of tooth formulae. N=D×P=9×5=45 teeth, and the value of "y," .123, obtained from table of constants "y." We, therefore, have W=8000.×.6283×1 9-16×.123=966 lbs.

If 5 diametral pitch is selected, the gear will have insufficient strength to develop 3 horse power on a load of 1050 lbs., but the necessary load can be obtained by increasing the face length of T diametral pitch, or by selecting the next diametral pitch, which is 4. The number of teeth of 4 diametral is 4×9=36, and the value of "y" from the table becomes .118, therefore W=8000×.7854×2.×.118=1482 lbs., which is well over the required load, and the teeth, therefore, amply strong.

"LEWIS"

SAFE WORKING STRESS FOR DIFFERENT SPEEDS.

Speed of Teeth in feet or minute	100 or less	200	300	600	900	1200	1800	2400
Cast Iron	8,000	6,000	4,800	4,000	3,000	2,400	2,000	1,700
Steel	20,000	15,000	12,000	10,000	7,500	6,000	5,000	4,300

We shall select 4 diametral pitch then, and determine the size and strength of the pinion. The number of teeth in pinion, obtained from the speed ratio of 3 to 1 is $\frac{36}{3}$=12, and the value of "y" from table is .077. For a cast-iron pinion the load W=8000×.7854×2×.077=967 lbs. As the strength of a pair of wheels is measured by the strength of the weaker of the two, it is evident that if the pinion is made of cast-iron, the pair will not have sufficient strength to carry the load. Also, as the pinion is subjected to three times the wear imposed on the gear, it is advisable to make the pinion of steel. The value of "s" for steel at a velocity of 100 feet per minute or less is 20,000, and our load W=20,000×.7854×2×.077 = 2419 lbs., which is amply sufficient. The tooth parts may be obtained from 4 diametral pitch, in table of tooth parts, and noted on the drawing of the wheels, Fig. 2.

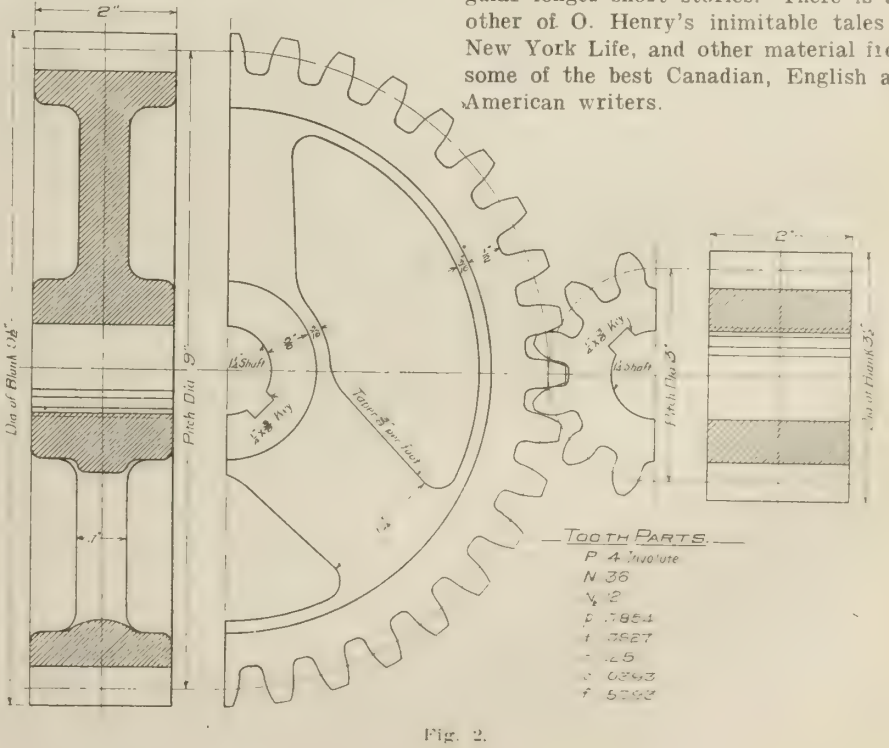


Fig. 2.

For six months the editorial department of MacLean's Magazine has been collecting little short stories from Canadian writers, until now there is a large enough stock to allow the magazine to give in the August number several of these "Little Tales for Summer Weather" all at once. There is "The Green Hour," by Deshler Welsh, a regular contributor for the better American Magazines. Then "Sally's Soul", "The Lonesomeness"; "Music Hath Charms"; and others, offer short, crisp reading for these hot months. Of course, in addition to these articles there are the regular longer short stories. There is another of O. Henry's inimitable tales of New York Life, and other material from some of the best Canadian, English and American writers.

Conference on the Education and Training of Engineers*

By G.T.R.

The Object of This Conference Was to Consider the Methods of Preparation to be Adopted by Those Who Contemplate Entering the Engineering Profession. While the immediate Purpose Was That of Compliance With the Conditions Laid Down in the By-laws for Election to the Institution of Civil Engineers (British) the Scope of the Field Involved Makes the Work Done at This Conference of the Greatest Interest and Moment to All Engaged in Mechanical Pursuits.

A CONFERENCE on the "Education and Training of Engineers," was held at the Institution of Civil Engineers, London, Eng., on June 28 and 29, Mr. Alexander Siemens president of the Institution, presiding. The work of the conference was divided into three sections, as follows: First—General Education. Second—Scientific Training. Third—Practical Training. Each section had individual chairmen, in the persons of Anthony G. Lyster, Professor W. C. Unwin, and R. Elliott-Cooper, respectively. The sectional arrangement was based on the Institution by-laws, which require that a candidate for membership should possess. First—A sound general education developed on lines suited to subsequent scientific study; Second—A competent knowledge of those branches of science which formed the basis of engineering; Third—Practical training under actual engineering conditions

President's Opening Address.

The president, Mr. Alexander Siemens, in his opening address said that the problem submitted to the conference might be expressed by saying, that a young engineer should be educated so as to become a dividend-earner for his employer, for this was the most reliable indication of his merit, and the corresponding reward would not be wanting. For the same reason, he should possess some knowledge of business methods and of law, not with a view of becoming his own lawyer, but in order to be able to judge when legal advice was needed. Besides all these requirements he would find one or more modern languages very useful for obtaining remunerative employment, as the value of his services was thereby increased in the estimation of his employer. The omission of this "business" aspect of education should not be taken as a sign of its unimportance, but owing to the short time at its disposal, the council considered it desirable to indicate the lines to be followed, by asking a number of prominent men to open the discussion on definite subjects in the three sections of the conference, all of which had a direct bearing on the question of so instructing young men as to fit them to take part in the design, as well as in the control and direction of engineering works.

It was not proposed that definite resolutions should be arrived at by the conference, but that it should be simply a means of forming and maturing the views of those interested in the subjects brought forward for discussion.

Sir William White.

Sir William White, late chief constructor at the British Admiralty, said they were apt to forget that the average student was the man they should provide for, and that the exceptional man, whether he became, like the first Lord Armstrong, an engineer by necessity, or found his way up from the humblest position to the highest ranks by sheer ability, would always take care of himself.

He stood amongst those who thought that the danger of excessive devotion to the scientific side was very considerable in these days, and that the Institution was doing well in recalling attention to the absolute necessity for a thorough practical training. For a long period British engineering was not based on scientific methods to the extent it ought to have been. Then when the scientific training began, there was the danger of undue exaltation of such knowledge. He took it that in that conference, an endeavor was to be made to reach the golden mean.

Sir John Wolfe Barry.

Sir John Wolfe Barry said he entirely agreed that the best practical training should be given the engineers, and having been president when the examination system was set on foot, he thought perhaps he ought to say that the particular work which had to be taken in hand at that time, was the scientific preparation of engineers for their profession, and which up till then, had been neglected so far as the conditions of belonging to the Institution were concerned.

The necessity for a grounding in the scientific lines of the profession was felt to be important, and he thought they had done rightly in giving a prominent place to it when the system of examinations was started, although he believed the council always foresaw that to be only part of the business. At that particular time it was the essential part, and no one could doubt that the status of engineers in the scientific world and the world at large had been very considerably raised by the step which was then taken. The practical part of the training of an engineer had, of course, always been to a certain extent provided for by the by-laws of the Institution, and what was being done now was rather to give form and substance to the general regulations concerning practical training. To that extent he was entirely in accord with the general views which had been put forward by Sir William White.

There was another point on which he had felt strongly for some years, which was, that the general education of an accomplished gentleman should not be lost sight of in the curriculum of the engineer. What they all wanted, was to turn out an engineer as a cultured gentleman, with scientific knowledge of his profession, and with that practical training, without which he could put neither the one nor the other into use in the career which might lie before him.

Sections I and II—General Education and Scientific Training.

The sections devoted to general education and scientific training met jointly under the chairmanship of Mr. A. G. Lyster, who in the course of his opening remarks emphasized the importance of the conference. The general education of young men desiring to become engineers required the closest attention of those who, on the one hand, realized what the necessities of the profession demanded, and those on the other hand who controlled the selection and organization of education; and so it seemed very fitting that, in contradistinction to the too prevalent practice of "muddling through," the heads of the universities and public schools should meet the members of the profession, and discuss with them the best preliminary training for those who were hereafter to uphold its traditions. Education to be of real value should not only furnish information and knowledge, but should also train and expand the intelligence and develop that type of character which fitted

*First of a series of articles.

a man to lead the best and most useful life; and all subjects and methods which could produce this result should be included in the curriculum of universities and schools.

It should be remembered, however, that a great many of these institutions were founded and organized in days when the conditions of life were very different from what they were to-day, and certainly much less strenuous, and when competition, both individual and international, was much less keen. The choice of professions, too, in those days was much more limited, and so the curriculum established was one which lent itself much more to the development of scholarly culture than to the practical requirements of those who to-day had to fight the keen battle of life. With an ever-increasing intensity of struggle, and with the development of science ever enlarging its boundaries, and multiplying its complexities, the demand for special training for the engineer became increasingly urgent, and unless he was to be debarred from the universities or public schools, it behooved the authorities to bring their educational standards into line with modern requirements.

Engineering Degrees—Note I.

The section devoted to scientific training began its separate work with a discussion of the value of a university degree in engineering science, in relation to professional competence.

In the first note, Professor S. M. Dixon said there was no doubt that the work carried out for the degree must deal mainly with principles, and should be as broad as possible. Details of current practice would be noticed only as illustrations of principles. In dealing with materials, the engineer needed a knowledge of mathematics, physics and chemistry, and if he was to avoid mistakes, his knowledge must be very exact and at his finger ends. The courses in mathematics, physics and chemistry naturally led to those in surveying, stresses in structures, and properties of materials. All these were technical subjects, but they could be far better and more easily taught in the class-room, field, laboratory, and drawing office of a university than in the engineer's office. A liberal education also was essential. Literature, history, philosophy, and all subjects which tended to broaden a man's outlook, should be studied, this being even more necessary in the case of engineering students than in the case of those who intended to follow other professions.

The general culture which came from college life as well as from college study was an asset in the engineering profession, not to be despised and not easily obtained. The man who led his fellow-students in the class-room, in sports, or in the debating society, was equipped in a very real way for success in his profession. The final examination was but a very small part of the requirements for a degree. Three or four years of solid work under personal teaching, sifted out a large proportion of those entering on the courses, while at the same time few students who possessed industry and average ability should fail to satisfy the present requirements in the specified time.

At present the university method was recognized as the only generally applicable method in every country but our own. The objections to the system in this country were stated by two classes of engineers; those who had in their early days entered university courses and then dropped them before grasping the meaning of the instruction offered, and those who had risen to eminence in their profession before university training in this country became general. The former were answered by the fable of Aesop, in the fox who tried to make the best of a serious accident; the latter were reminded that competition in the profession was becoming keener every day. English engineers now found in every country friendly rivals who had spent a large part of their time at engineering colleges, and it would be unjust to the rising generation if they were not able to start with advantages equal to those of their competitors.

While in other professions a university degree was regarded as the first requisite, and so led directly to employment, there was still a feeling in some quarters that the university graduate was rather in the way in an engineer's office. Matters, however, were improving. Once engineering firms recognized the advantage of having assistants thoroughly trained in the principles underlying practice, whose training also specially fitted them for adopting new ideas rapidly, they would be only too glad to co-operate with the universities in completing the education of the engineer.

Engineering Degrees—Note II.

In a second note on the same subject, Professor C. F. Jenkin said that in order to estimate the value of a degree in engineering science, it was necessary to understand clearly what the possession of the degree meant. It meant that the graduate had spent some years in passing through a carefully arranged course of study in those fundamental subjects which should form the basis of engineering education, and also that he had attained a certain standard of proficiency in them, as far as that could be tested by examinations. A degree was a very much better proof of the possession of a good theoretical training than any examination could be. That an examination was in general a poor expedient for ascertaining a student's proficiency was becoming more widely recognized every day; it was, however, less unsatisfactory when held on the completion of a definite course of study, than when it was used as a test for general scientific knowledge. Further, the degree course contained much that could not be included in the examination at all. For example, much of the student's time was spent in the laboratory, learning how to measure accurately all sorts of physical quantities, and to carry out tests on all sorts of machines. Again, there was the teaching in the drawing office, where the student learnt to use his theory in the preparation of actual designs, and the the field course of surveying, during which he learnt to handle his instruments skilfully and accurately. These were all implied in the degree, but it was almost impossible to take any account of them in an examination. Again, to spend some years at a university was an education in itself, and would be a permanent asset in the boy's life, while if the engineering profession was to be brought under State control, as medicine was, and also the law— in a modified sense—it would appear to be wise, to make the basis of qualification as broad as possible, by recognizing the engineering degrees of the universities as a necessary qualification, rather than a certificate by a single institution, even although that institution were their own.

Section III.—Practical Training.

The chairman, Mr. Elliott-Cooper, in his opening remarks, suggested the necessity of agreement as to what was meant by "practical training," and said that the first point he wished to make clear, was that real and useful practical training, whether in design, construction or management of works, could be obtained only under the actual or commercial conditions which necessarily could not be found in educational establishments. The routine (under proper supervision) of the drawing office and works, whether in the civil or mechanical branch, was just as important now as it was considered in former days, the only difference being, that the young engineer of to-day was better equipped, by reason of the advance in scientific education, to take advantage of the practical training afforded him. To deal for a moment with "civil" engineering (as distinct from mechanical engineering), it was obvious that any efficient training must embrace experience in various

kinds of work, such as designing, drawing, specifying and estimating, all of which would be part of the ordinary routine of an engineer's office. He must also be trained in construction work, embracing, setting-out, measuring up, and general administration. Many young engineers made the great mistake of thinking that all that was necessary on completion of their college career to make them efficient assistant engineers, was either to go into a workshop and spend, say two years on the ordinary work of a mechanic, or (if "civil" engineering was to be the career) to go to a contractor upon some works of construction. The knowledge so gained was most useful, but without the office training they were only half equipped for the work of their profession.

Apprenticeship and Pupilage.

There was doubtless a belief in some quarters that the system of training by definite apprenticeship and pupilage, which was certainly affected and modified some years ago, by reason of the movement in favor of better scientific education, had fallen largely into disuse, and statements were sometimes made that it had been actually abandoned by the majority of engineers. Such an idea could arise only from an imperfect or very partial acquaintance with the engineering profession. An inquiry made on behalf of the council some months ago, in order to ascertain the position of pupilage, or other equivalent practical training, in manufacturing work shops and in the engineering departments of important railways, docks, and other large undertakings and authorities, showed that in 75 per cent. of the cases considered there were regular arrangements for pupilage, and in only 25 per cent. was no provision made for such regular practical training. Of the 25 per cent. more than half the cases occurred in the engineering departments of municipal authorities, which certainly might be expected to make better provision for the acquisition of practical training of a kind suited to prepare young men to become competent municipal engineers. The inquiry was not addressed to engineers in private practice, but it was a matter of common knowledge that the system of pupilage remained extensively recognized amongst consulting engineers, although the requisite term of such training had been shortened, in view of the better educational qualifications now generally possessed by young engineers.

Works Training and Scientific Study.

A note on the "Apportionment of Training between Practical Work and Scientific Study, with some suggestions Applying to Apprentices in or on Works far distant from their Homes," was contributed by Mr. A. F. Yarrow and members of his staff.

Dealing with the social aspect of the "sandwich system," which had perhaps been overlooked, they said they had frequently been impressed by the need of engineering students being accommodated with courses of study which would enable them to get their practical training without the necessity of being banished from home influences for a continuous period of several years at a most critical time in their lives. If the practical and theoretical training could be so arranged that during the six summer months they worked in the shops while living in lodgings, and during the six winter months they took up theoretical study in the colleges, living at home and subject to good influences and affectionate surroundings, this home influence would be a source of great security, especially if the six months they worked in the shops were during the summer, when their spare time could be spent in outdoor pursuits. Unless courses of study could be arranged to alternate with periods of practical work, so that the young man avoided being banished from his home, he would clearly be placed at a disadvantage compared with those young men whose homes were in the manufacturing districts, such as Glasgow, Newcastle, or Birmingham. For these reasons the colleges, especially those in London, should endeavor to arrange their courses of study so as to conform to the social conditions indicated as desirable, and should arrange their engineering courses of study during the winter months.

Apprentice Adviser.

In the second place, attention was drawn to the desirability that in works some member of the staff should be looked upon as an adviser to the apprentices. It was clearly undesirable for an apprentice to be simply under the eye of the foreman, and those who had worked in the shops would know that it was almost impossible for him to obtain an interview with the heads of the firm. It would, therefore, be a very desirable thing, if in works, some gentleman could make it part of his business, as it were, to befriend the apprentices. He should be accessible at all times, and should make a point of interviewing each lad at least once in three months. He should also from time to time ascertain what progress was being made by those lads who attended evening classes, by periodical visits to the local technical schools. A record should be kept in a book, so that the heads of the firm could see at a glance the opinion formed of the various apprentices. It was a notorious fact that employers had often lost the services of capable men through being ignorant of the talent that had passed through their works.

Requirements of Works Training.

The title of a note by W. H. Allen was "The Requirements of Practical Training in Works, with the Necessary Complement of Scientific Study."

He said it was often asked, in the case of a student determining to go both to college and to works, which he should enter first. He would say, that the man who set himself the task of obtaining his degree before entering the works, stood a much better chance of securing a higher and more responsible position in life than the one who was trained in the reverse order. The former not only took a greater and more complete interest in the works and workshop life, but made the most of his time, and grasped ideas and their principles much more readily than the man who came to the works with merely a public-school training.

Study During Practical Training.

Another question frequently asked was, "How much study should a pupil undertake during the period of his practical training?" If a young man conscientiously did his duty from 6 o'clock in the morning until 6 in the evening, he would find that as much as his health could stand, without burdening it by further serious study at night. At the same time unless some attention was paid to the work which has been done at college, this part of his studies was apt to lose its freshness and interest for him, his attention being concentrated purely on his daily task to the exclusion of everything else. The author's custom had been to give lectures weekly, explainatory of the actual work being carried on in the shops, thus greatly increasing interest in and adding to the knowledge of the work being done.

Workshop Training Requirements.

As regards the requirements of workshop training, there seemed little doubt that a period of three years—the actual time depending on the previous education of the subject—including a year in the drawing office, should be spent in the works in a not too specialized manner; that was to say, it should cover work in some or all the branches of mechanical and electrical practice, which might be found in some of our better establishments. It would always be difficult, if not impossible, to lay down a plan for either scientific study or works apprenticeship which would suit all, and each individual case would require consideration on its merits. At any rate, whatever plan was adopted, would have to be very elastic as regards the arrangement of details. The tendency at present was to attach rather too much importance to the direct value of scientific study, as being the means of providing the student with certain mental tools for use in after-life, and too little to the development of the mental faculties generally, and the cultivation of a true scientific insight.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

By J. S. Van Cleve

DEFECTS IN GAS ENGINE CASTINGS.*

IT is said that the same method of molding prevails now that did when Solomon built the temple. This may be so, but I am very sure that King Solomon never made any water-jacketed gas engine cylinder castings. This is one way of saying that there has not been the same advance in foundry practice, as there has been in the demand made on the foundry. This may be true with respect to the majority of foundries, but a few which have specialized on complicated gas engine castings are getting very satisfactory results. For the past dozen years there has been a growing tendency to shift more and more of the responsibility upon the foundry, and those of us who have given special attention to this class of work have been kept very busy, devising ways and means to meet these requirements.

Pattern Requirements.

Gas engine castings must not only be true to pattern, but the iron must be homogeneous, and entirely free from interior as well as exterior defects. To obtain these results three things are necessary. First, a pattern properly designed to take care of the strain and shrinkage. Second, a proper mixture of iron, and third, workmanship. The foundry seldom has a chance to take care of the first item. The tendency is to let the pattern maker construct the patterns as he sees fit, and then to put it up to the foundry to produce the castings. Where it is possible, however, the pattern shop and the foundry should work hand in hand, with a view to not only getting good, true, sound castings, but with a view also to producing them at the least cost.

By a pattern properly designed, I mean more than the mere construction of a well built, nicely finished pattern. You must not only have the pattern built as well as it can be built, but careful study must be given the method of construction. Oftentimes patterns can be parted in various ways and at various places. Great care should be taken that the parting of a pattern is given proper consideration, because pattern makers use the easiest method for them rather than consider the best for making castings.

In intricate work where cores of irregular outline are necessary, driers, truly speaking, are a part of the pattern as well as gauge boxes in which to gauge the cores, therefore the gauge for setting the cores should be furnished the foundry, along with the pattern. Where such parts are necessary in order to produce accurate castings, and are not furnished by the customer, the foundry either has to construct them for the customer or at its own expense, and where the customer refuses to furnish these essential parts, such as drier patterns and gauges, the foundry is often tempted to handle the work by means of bedding the core, with invariably poor results.

Metal Mixture.

The second point, that of mixture, is a great deal like a patent medicine receipt. No foundry which has made a success of gas engine castings likes to tell another foundry how it is done. Our own experience has been that it was just as dangerous to make our iron too rich as too poor. A great deal depends upon the coke. Having once found a coke that will do the trick, stick to it, but never take a chance. Have every car analyzed. and refuse every car that does not come up to the mark. Buy your coke analyzed and then see that you get what you buy.

In addition to this, there is no doubt that some good results can be got with various kinds of dope, such as thermit and manganese, and there are certainly times when nothing else sems to meet the case. A few years ago this subject of mixture was one of minor importance in the foundry, as engine manufacturers seemed content with a grade of iron that would hold together, and with an engine that would run and sell. To-day, however, the successful engine builder is constantly striving to improve his engine and prolong its life, and great thought is given the mixture in the various castings. This is especially true of cylinders, heads, valves and pistons. The customer of to-day has also become enlightened on engine construction and is not altogether satisfied with a good looking, good running engine, but wants an engine that is made up of the best possible materials. In view of these facts, conditions in the foundry have changed so that the problem of making satisfactory mixtures is no longer the simple one that it was, but is now a subject of vital importance, and the foundry to-day that is not looking after this part of the work, with a view to bettering the conditions at all times, is losing ground in the engine field. To produce a clean casting with a strong fracture, a close grain free from internal shrinkage, and yet an iron that will machine freely, is what the foundry has to do, in order successfully to turn out good engine cylinder castings and like parts.

Foundry Problems.

In view of the various designs of engine cylinders, the foundry is often put up against many very difficult and expensive problems to solve which I feel safe in saying, none of you engine manufacturers fully appreciate, except perhaps those of you who have a foundry of your own. When you get a close grain iron, the foundry meeets with the troubles which are due to shrinkage, caused by uneven metal lines. For example, take a spark plug boss. This boss is surrounded by light jacket walls, and is generally marked by a boss on the outer side of the jacket. From this mark on the casting a solid plug of metal varying in size according to the size of cylinders, extends to and connects with the barrel wall.

Now this uneven distribution of metal which we realize is necessary causes the foundry no end of trouble. It is not only in this particular case that such troubles exist, but all such places on cylinder castings are apt to cause similar troubles if close grain iron is used. Hence, the necessity of extra care to bring about uniform cooling, which in the case of engine cylinder mixtures must be done by means of chills. A knowledge of the successful use of chills is a part of the work that is only gain-

*Read before the National Gas and Gasoline Engine Trades Association, Detroit, June 20, 1911.

OUR ADDRESS.

Many visitors to Toronto intending to call upon Canadian Machinery, take the most convenient method of getting our exact address—the telephone directory. Through an oversight on the part of the Telephone Company, the latest directory gives the wrong number—111 University Street. The street was recently renumbered, and the entrance to our office is now 143 University Avenue, just the centre of the next block north of the number given in the telephone directory.

ed by experience, and in many cases is of as much importance as, if not more so, than the mixture itself.

To prove this, you can take a pattern from a foundry which has been running on it successfully and put it in another foundry which is using the same analysis, and yet get very unsatisfactory results, if the second plant has not a full knowledge of the use of chills. In considering this statement, please bear in mind that the iron has to contain the same distribution of carbons. The mere comparison of silicon, sulphur, phosphorus and manganese is not what I base my statement on. Carbon is the life of the iron and should be given constant attention, for you can often take two mixtures that will run alike or so nearly alike in silicon, sulphur, phosphorus and manganese, that the slight difference would have no effect one way or the other, and yet find a vast difference in carbon contents, which will produce entirely different results in the casting. Therefore the study of design, and a knowledge of changes which take place in the irons while cooling, and the effect that this change has upon the casting, and a knowledge of how to overcome these effects, are essential to the production of what I have called a proper mixture.

Foundry Rigging.

When you get to the third requirement, that of workmanship, you are into a very broad subject which could be almost indefinitely subdivided. The subject of minor foundry rigging is one of tremendous importance. Under this heading I have already mentioned gauges, core driers and patterns for chills. Skim gates and special flasks are scarcely less important. After foundry rigging, only second in importance, is the matter of proper gating.

It is a constant source of surprise to me, to see what a difference there is in the quality of castings when the molds are properly gated and when they are not, and how a very slight divergence or deflection may produce very far-reaching results. Break up an automobile cylinder casting, for example, and see what a difference there is in the constitution of the iron in that part of the walls where the mixture is allowed to pass continuously, and in those parts where it necessarily stagnates.

Workmanship.

Finally we come to the question of manual skill in the construction of the molds and cores and in the setting of the cores and securing of the molds. Gas engine castings, as they are made to-day, will not admit of the slightest degree of carelessness or indifference, and except in cases where the molders and core makers are making the same thing over and over again, it seems next to impossible to impress upon them the importance of absolute precision. The foremen and superintendents should be untiring in their efforts to impress this upon their men in the case of every new pattern, and should stay with the men until every possible precaution has been taken. Molders do not realize how much depends upon the form and style of chaplets used in different cases, nor do they exercise enough intelligence in the matter of venting. They must be shown these things in detail in each case, and then held strictly responsible for their work.

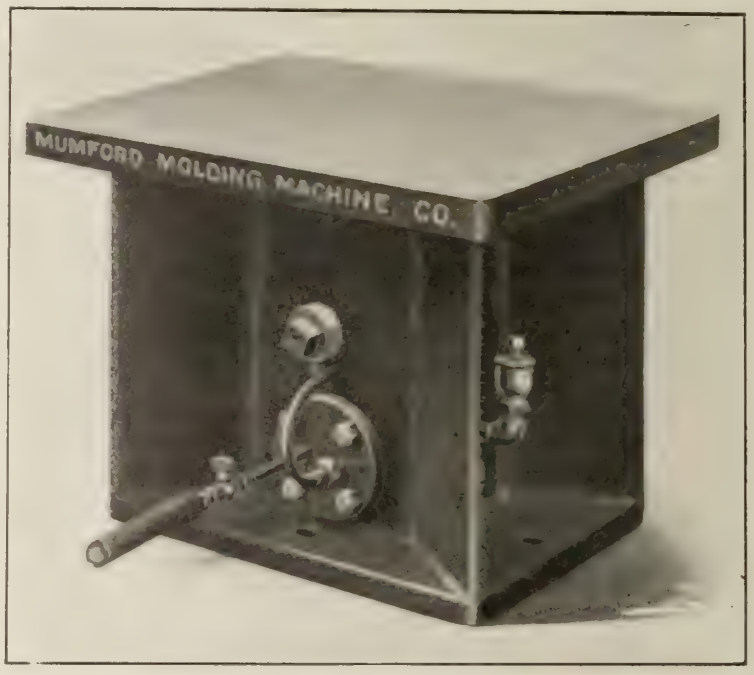
Losses by Manufacturers.

Gas engine manufacturers have suffered enormous losses in their castings from three causes principally. First, they trust their work to foundries who may be very skillful in other lines but have had no experience in gas engine castings. Second, by trying to buy their castings too close. No foundry which specializes on gas engine castings fails to realize that the incidental expenses in this line are much greater than in others, and yet being in competition with jobbing foundries, they are often compelled to do the work at prices which do not leave a fair margin of profit, and sometimes no profit at all. In such cases, it is only human nature to shirk somewhat, in the effort to economize. Again manufacturers of gas engines have suffered much loss from their insistence upon too great haste on the part of the foundry. Ample time should be provided for designing a pattern; and then ample time should be given the foundry to study it, prepare the rigging, and instruct the men. The policy of "rush the pattern makers" and then "rush the foundry" is a ruinous one.

There are many foundries thoroughly competent to produce the highest grade of gas engine castings, and these should be given a fair margin of profit and plenty of time to get out the work.

CORE BENCH JOLT-RAMMER.

A core bench jolt-ramming machine, built by the Mumford Molding Machine Co., Plainfield, N.J., is shown in the accompanying illustration. It may be placed on a concrete pier, iron post or wood foundation, and is especially adapted for ramming irregular cores. The machine is actuated by a knee valve under the bench, thereby permitting the operator to use both hands to manipulate the material and the core boxes.



Core Bench Jolt Rammer

While the capacity is 300 pounds, with 80 pounds air pressure, it can be used to advantage on small slender cores, which, together with the boxes, weigh only a few pounds.

Jolt Ramming Machines are generally associated with very large and deep molds, and only recently the facility of settling sand into deep pockets, and among the rods and wires of small cores on the core bench, has been appreciated. The valve consists of a plug of case-hardened machinery steel, having a 3-16-inch vertical stroke, and to all intents and purposes the construction is that of a valveless plunger. The economy in air, however, is superior to that of more elaborate valve mechanisms, used on jolt ramming machines. The size of table is 15×20 inches, and the diameter of the plunger is 3 inches. The finished shipping weight of the machine is 325 pounds.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

MACHINING A DOG TOOTH CLUTCH.

By H. S. G., Toronto.

THE following is a "rig" that was used successfully to machine the inclined faces of a "dog-tooth" clutch on a shaper. A, Fig. 1, is a $\frac{7}{8}$ inch eye-bolt threaded for about 9 inches. B is a hand wheel from the scrap heap, drilled and tapped $\frac{7}{8}$ inch, with a groove $\frac{1}{2}$ x$\frac{1}{2}$ inch turned in the hub. D, Fig. 2, is a bar with a 1 inch hole to guide the screw, and E Fig. 2, is a bar with a fork to engage the groove in the hand-wheel hub. The prongs of the fork are rounded off as shown, to allow for the swing of the eye bolt.

The swivel table was mounted on the shaper and bolted down just tight enough to allow it to swing without shake. The clutch to be machined was clamped down concentrically on it, and the eye-bolt connected to the corner of the swivel table at C, Fig. 1; the carriage being set, so that the tool passed through the centre line of the clutch. The clutch was marked-off from a template, and as the tool was fed down to the work, the swivel table was swung by the hand-wheel. In machining a long tooth, the work might have to be done in two parts by running the hand wheel as far as possible in one direction, then running it back, and re-setting the clutch on the table to finish the rest of the cut.

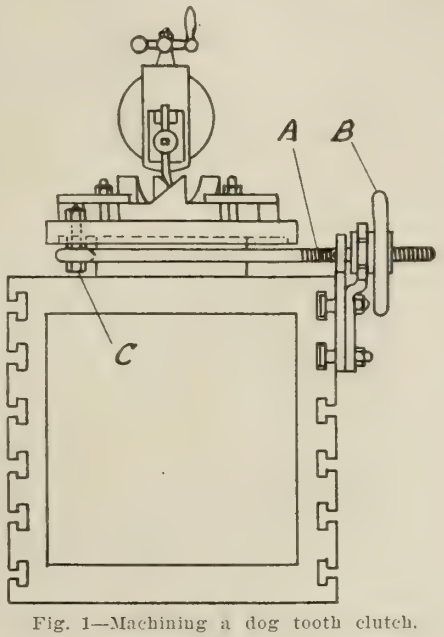


Fig. 1—Machining a dog tooth clutch.

AN AIR HOIST DEVICE.

By G. T. R., Toronto.

The top cylinder covers of air hoists are frequently damaged, due to the piston striking them, as a result of careless operation. Trouble like this may be easily prevented by the use of a light coil spring arranged as shown in the cut. A washer about 3 inch diameter should be placed above and below the spring, the coils of the latter being of $\frac{1}{4}$ or 5-16 inch steel, depending on the size of hoist and air pressure. This simple device costs little, and may prevent damage with its accompanying annoying delays for repairs.

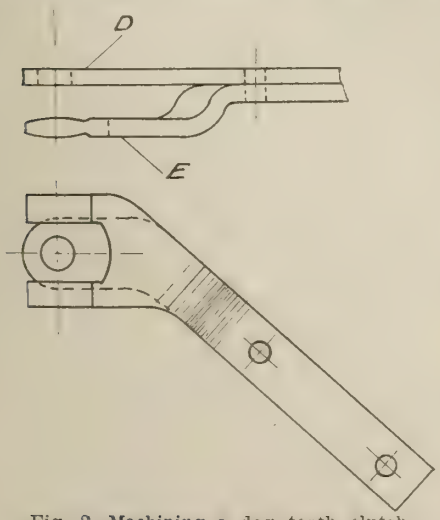


Fig. 2—Machining a dog tooth clutch.

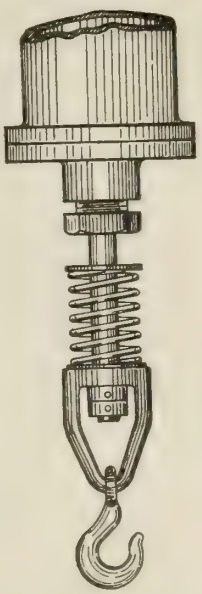
JIG FOR LOCOMOTIVE SIDE ROD BRASSES.

By L.S.R., Winnipeg.

The cut shows the usual form of jig for planing the rod-fit, on locomotive side-rod or main-rod brasses.

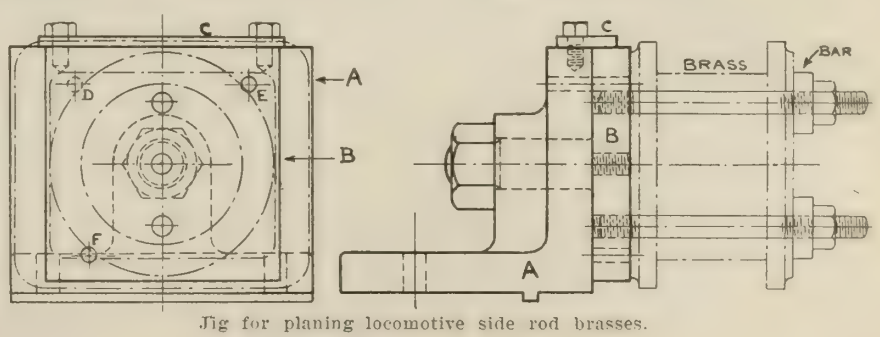
A is an angle bracket, bolted to the table of the planer or shaper. The top edge is machined parallel with the base, and a planed strip. C, is bolted to it by studs or set screws. B is a square block, having at its centre, a round shank which fits snugly into a corresponding hole in A, and is clamped in place by the nut at the back.

One edge of B is brought in line with the top edge of the angle plate, A, so that the plate C lies evenly on both. The brass is then bolted to the face of B by means of the long studs and bars shown, and is centred and roughly levelled. The top edge is now planed. Afterwards, the plate C is removed, the large nut slackened, the block B revolved through 90 degrees and the plate C replaced. Another edge of the brass is planed next, and so on for all four sides.



Air hoist device.

In cases where one end has to be planed taper to fit the adjusting wedge, the strip C, is removed. The hole D, is in the angle plate, while holes E and F are in the block B. E and F, are so located, that when one or other of them is brought opposite hole D, and a pin inserted, the top or bottom edge of the brass is at the correct angle for planing the required taper.



Jig for planing locomotive side rod brasses.

TWO USEFUL TUBE CUTTERS.

By J. Harcourt, Toronto.

TWO tube cutters for locomotive boiler tubes are here described and illustrated. Fig. 1 shows a cutter for 2-inch tubes, and is an extremely handy tool. The body is made to fit into the tube, and has a hole 11-16 inch square, in which the cutter slides. The spindle and jaw for driving the tool are solid with one another, the former having a short cylindrical projection at one end, and ¼-inch out of centre with the spindle. This projection engages with a slot across the body of the cutter, and moves the latter up and down in the square hole, when the jaw is turned to right or left.

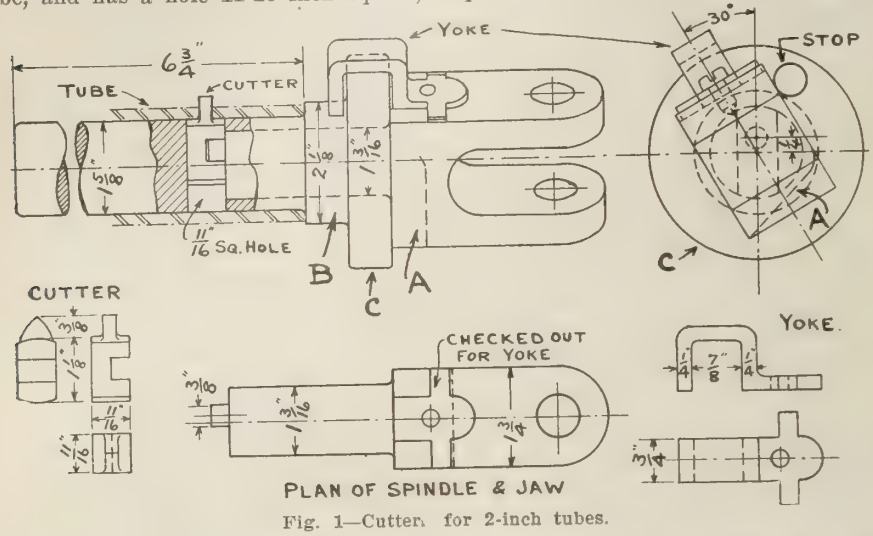


Fig. 1—Cutters for 2-inch tubes.

Having brought the cutter to the bottom of its stroke, the tool is inserted in the tube and the jaw turned to the right, thereby raising the cutter, and so piercing the tube. When the cutter is in this position, the side of the jaw is bearing against a stop, shown in the end view, and on the motion being continued to the right the tube is sheared all round. The strain is taken by the stop, which consists of a stud projecting about ½-inch. The bottom side of the jaw has a tapered groove, A, ⅝-inch wide, which enables it to be turned back to the left sufficiently to bring the cutter point inside the tube again, and allow the tool to be withdrawn. The yoke withdraws the body of the tool along with the jaw and spindle. To do this, some force is necessary, therefore the yoke is recessed into the top of the jaw for a depth of ⅛-inch to take the shear off the small screw that holds it in place.

This cutter was sketched in the G.T.R. roundhouse at Toronto, and differs from the usual form in the yoke and the position of the stop. As used in the C.P.R. shops and elsewhere, there is a slot in the shoulder B, extending half way round the circumference; the stop being screwed into the spindle, and working from end to end of the slot. By this means, the yoke and the larger diameter C, are dispensed with.

It will be noted that with the above cutter only about 1½ revolutions of the jaw are required to cut each tube.

It may be operated by air motor or ratchet wrench. A stout bar is rigged up across the smoke box front and the motor or ratchet connected up to the jaw of the cutter by a series of rods having universal and telescope joints enabling any tube to be reached without shifting the motor.

3 in. Tube Cutter.

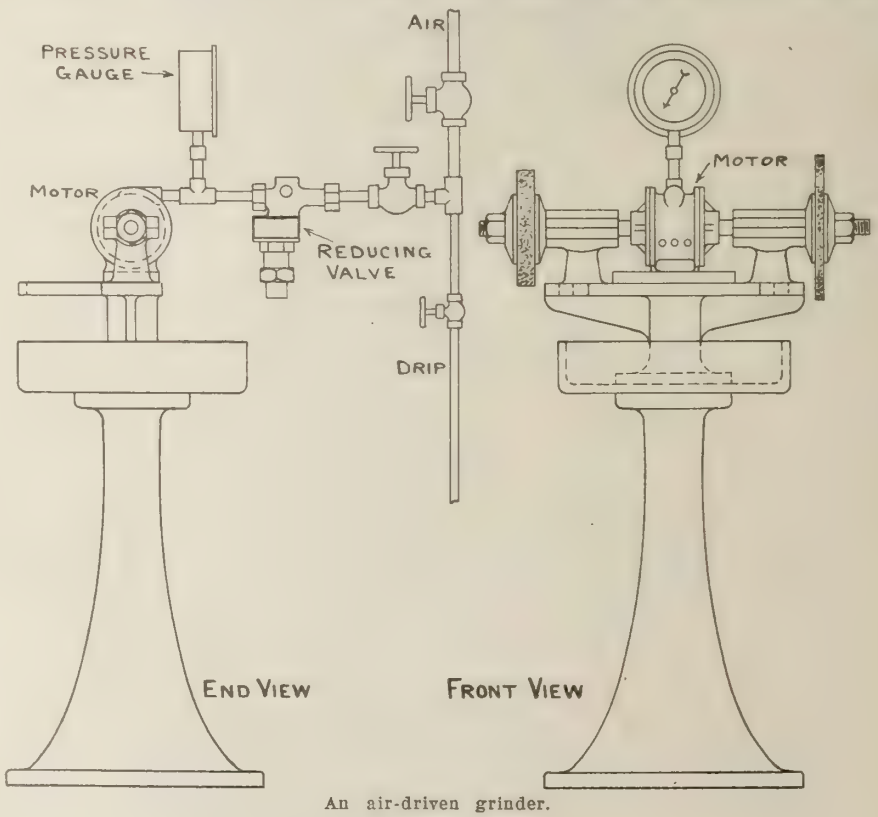
Fig. 2 shows another G. T. R. tube cutter as used at Toronto for cutting out the 3-inch arch tubes from locomotive fire boxes. It is made from a piece of extra heavy hydraulic pipe. The cutter wheel is carried in a jaw piece, which slides between two guides, and is wedged outwards through the tube by blows on the end of the shank. The whole apparatus is revolved by hand, through a long wrench on the squared end of the cap. When the tube has been cut, the wedge is easily drawn back by hand, the flat spring at once bringing the cutter wheel within the tube and allowing the tool to be withdrawn. The water space between the back head of the boiler and the door plate of the firebox varies on different classes of boilers; therefore a loose collar is clamped on the cutter to form a depth gauge, ensuring all tubes being cut off a uniform distance inside the firebox.

AN AIR-DRIVEN GRINDER.

The small double grinder shown in the attached cut was sketched in the Frog and Switch shop of the G. T. R. at Toronto. It is driven by a small air turbine or motor, mounted on the shaft, between two emery wheels. A reducing valve on the air line brings the pressure down to about 40 pounds per square inch, the pressure gauge being mounted where it can be easily read.

It is not claimed that this is a highly economical method of driving an emery wheel, but where, as in this case, there is no belt or electric drive available, it serves the purpose admirably.

For the sake of clearness, the emery wheels have been omitted in the end view. An idea of the scale of the drawing may be gathered from the fact that the thinner of the two wheels is 10 inches diameter, and that the centre of the spindle is 39 inches from the floor.



An air-driven grinder.

BORING A CYLINDER ON ENGINE LATHE.

By B.F.W., Toronto.

In the machine shop of B. F. Williams, Toronto, the problem presented itself, of how best to bore several cylinders on order. Their diameter was 8½ inches, their length 30 inches, and the only available machine for boring them was an engine lathe swinging 21 inches. Each cylinder being, of course, much too heavy to chuck in a lathe of this size, the latter was converted into a boring mill in the usual manner, by rigging up a boring bar and strapping the cylinder to the carriage, as clearly shown in the cut.

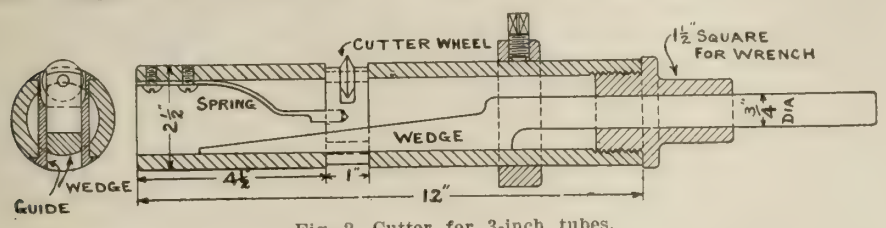


Fig. 2—Cutter for 3-inch tubes.

If the steady rest supporting the end of the boring bar had been mounted on the lathe bed, the carriage would not have had sufficient travel to do the job; therefore it was necessary to mount it on a short length of channel iron, attached to the underside of the bed and supported by two struts as shown. The lead screw had three bearings, one at each end and one behind the apron. To get the necessary length of travel for the carriage, the bearing at the tailstock end had to be removed, but the remaining two bearings were found to give ample support to the screw.

A piece of 2 15-16 inch shafting formed the boring bar, and as this had a sunk keyway already cut for a considerable portion of its length, it came in handy. An old damaged spur wheel, turned down to form the tool holder, was keyed to the shaft about 33 inches from the headstock end.

As will be seen from the cut, the cylinder had two feet, set close to each end. These were supported on two hard wood blocks, G, cut to fit the Vee ing cut. A first class job was the outcome.

Referring to the cuts, A is the boring bar; B the tool holder; C the tool; D the steady rest; E the piece of channel iron to which the steady rest is bolted; F the cylinder; G, the hard wood blocks; H, the wood packing between cylinder and carriage; J, the bolts holding down cylinder to carriage by means of the angles K; L. the packing strips between cylinder feet and carriage preventing motion of cylinder sideways; and M, the four jaw chuck.

While this method of boring a cylinder is not new, the process is an interesting one, in view of the "home-made" nature of much of the apparatus used.

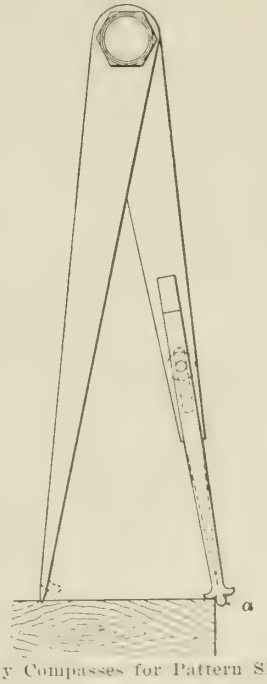
HANDY COMPASSES FOR THE PATTERN SHOP.

By a Patternmaker.

The accompanying illustration shows a handy and convenient tool for patternmakers' use. As a combined caliper and marking gage, it has proved itself most popular in the pattern shop where it was devised. Some patternmakers never use a hermaphrodite caliper, while others have the regular caliper which may be purchased in tool supply stores. Others again have home-made calipers. I employ this caliper when the work requires and very often I use it in preference to a marking gage.

The caliper that I describe in this article is remodeled from a standard make of calipers. It differs from the standard caliper in the reversing of the legs, as shown by the full lines, while the standard make is shown in the dotted lines.

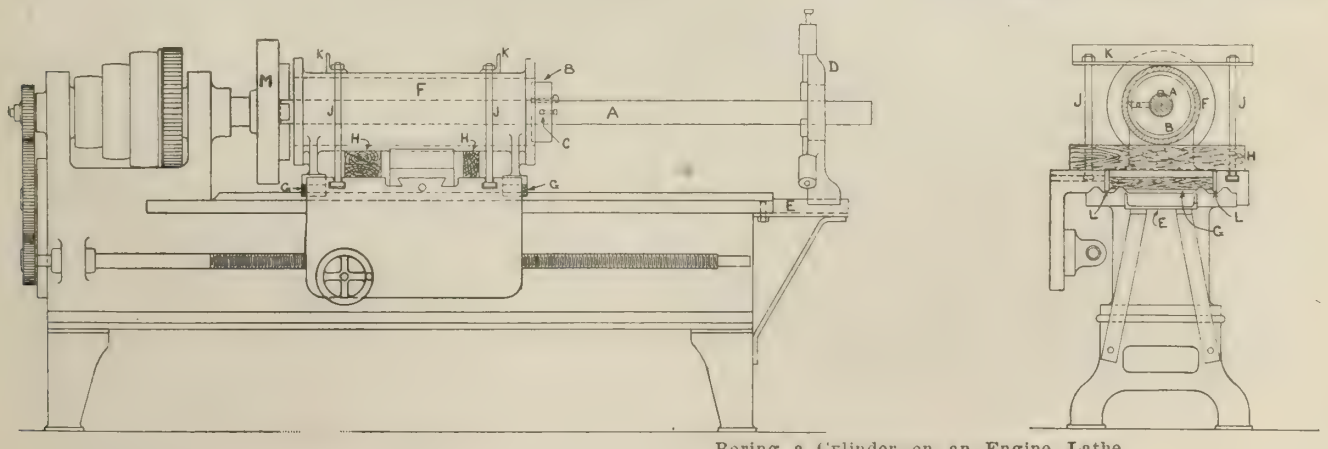
The dotted leg is drawn out straight, finished and tempered. Don't forget the temper. That makes its worth double. If you expect to use this or any other tool for the purpose of cutting or parting (which is the purpose of this tool) of the wood, the cutter must have a proper temper. The scratch leg is shown by the dotted line. I have removed this one and substituted the leg as shown in the full lines.



Handy Compasses for Pattern Shop.

The sketch is clear and complete and really requires no explanation. The stock is about 1-16 inch and the end at a is finished in the form of a ball.

For marking dimensions on turned work, this is a superior tool.—Castings.



Boring a Cylinder on an Engine Lathe.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

IMPROVED BENCH TOOL GRINDER.

THE accompanying half-tone shows an improved design of standard bench tool grinder recently put on the market by the Ford-Smith Machine Co., Hamilton, Ont. The usefulness of this type of grinder has long been demonstrated, and the present example has a special feature in the additional wheel on the outside, to take care of small drills or such other tools as cannot be conveniently ground on the larger wheel. This outside wheel can be readily changed for any special shape, should occasion arise.

Another feature is the hand hole for cleaning out, seen in front. This does away with the necessity for removing the hood and wheel spindle as in the older designs. An unusually large water pot is provided, and careful attention has been given to the guards and tray. The larger wheel is 12 inches diameter by 2 inches wide, and the smaller wheel 8 inches by ½ inch. The advantage of wet over dry grinding, providing sufficient water is available, is generally admitted, both on account of the time saved, the better finish on the tool, and the absence of liability to draw the temper.

This machine is known as the "12 inch Rapid" and is suitable for distribution around the larger shops at any point required. It is equally well adapted to the requirements of smaller shops, having the desired tendency to put the tool grinding on the right basis, at a minimum of expense. The bench space occupied is only 22 by 18 inches. Fast and loose pulleys, 5 inches diameter for a 3 inch belt, are provided, also an extra heavy spindle running in self-oiling bearings. If desired, the machine can be direct driven by electric motor on the spindle.

24-INCH SINGLE SURFACER.

THE wood surfacer illustrated, is built by the Valley City Machine Works, Grand Rapids, Mich., and will plane stock 24¼ inches wide by 8 inches thick. It is a double belted machine, as may be seen from the cut, which shows the surfacer with its gear covers removed.

The frame is designed to give ample strength, and has a large surface for the bed, the base being planed, so as to give a uniform bearing on the floor.

The main bed is raised and lowered by the hand wheel seen in front; is cast in one piece, with adjustment for wear by wedge and screw. The centre bed is held by four bolts, and can be taken out when required for trueing up. An index is located on the main frame, to indicate quickly the position of the table for a given thickness of stock.

A single cylinder made from steel forgings runs in long self-oiling bearings at 4,500 r.p.m. It carries two 5 by 5 inch driving pulleys, and is fitted with two knives. The four gear rolls are power driven, the feed gears being held together by a yoke and link, so that they cannot get out of mesh. There are two rates of feed. The upper feed rolls are adjusted by means of a wedge and screw, and are held down by heavy coil springs, thus enabling the operator to feed stock of varying thicknesses at one time. The weight of the machine is 2,200 pounds.

FOOTE-BURT HIGH DUTY DRILL.

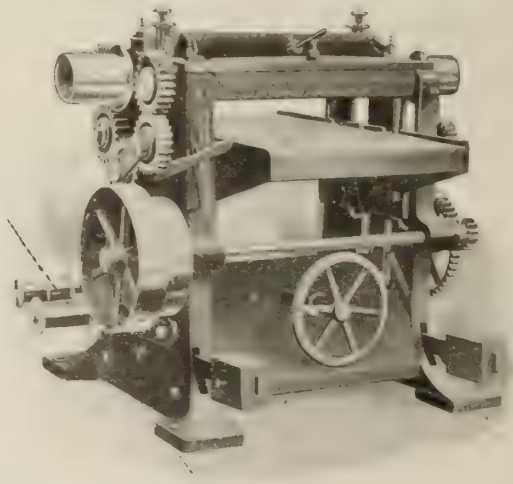
THE 36 inch swing, high duty drill press which we illustrate, was built by the Foote-Burt Co., Cleveland, Ohio, and operated at the equipment exhibit in connection with the Atlantic City conventions of the A.R.M.M. and M.C.B. Associations last month. Some extremely interesting drilling tests were there made on it, with "Paragon" high speed drills manufactured by the Cleveland Twist Drill Co., Cleveland.

General Description.

No special equipment was provided for this test, it being simply a standard machine, with a high speed drill capacity, up to 3½ inches dia. in solid steel. Nine changes of geared feed are provided, any one of which is instantly available without stopping. The power feed is provided with adjustable automatic and hand stops, while the hand feed is accomplished by means of worm and



Ford-Smith Bench Tool Grinder.



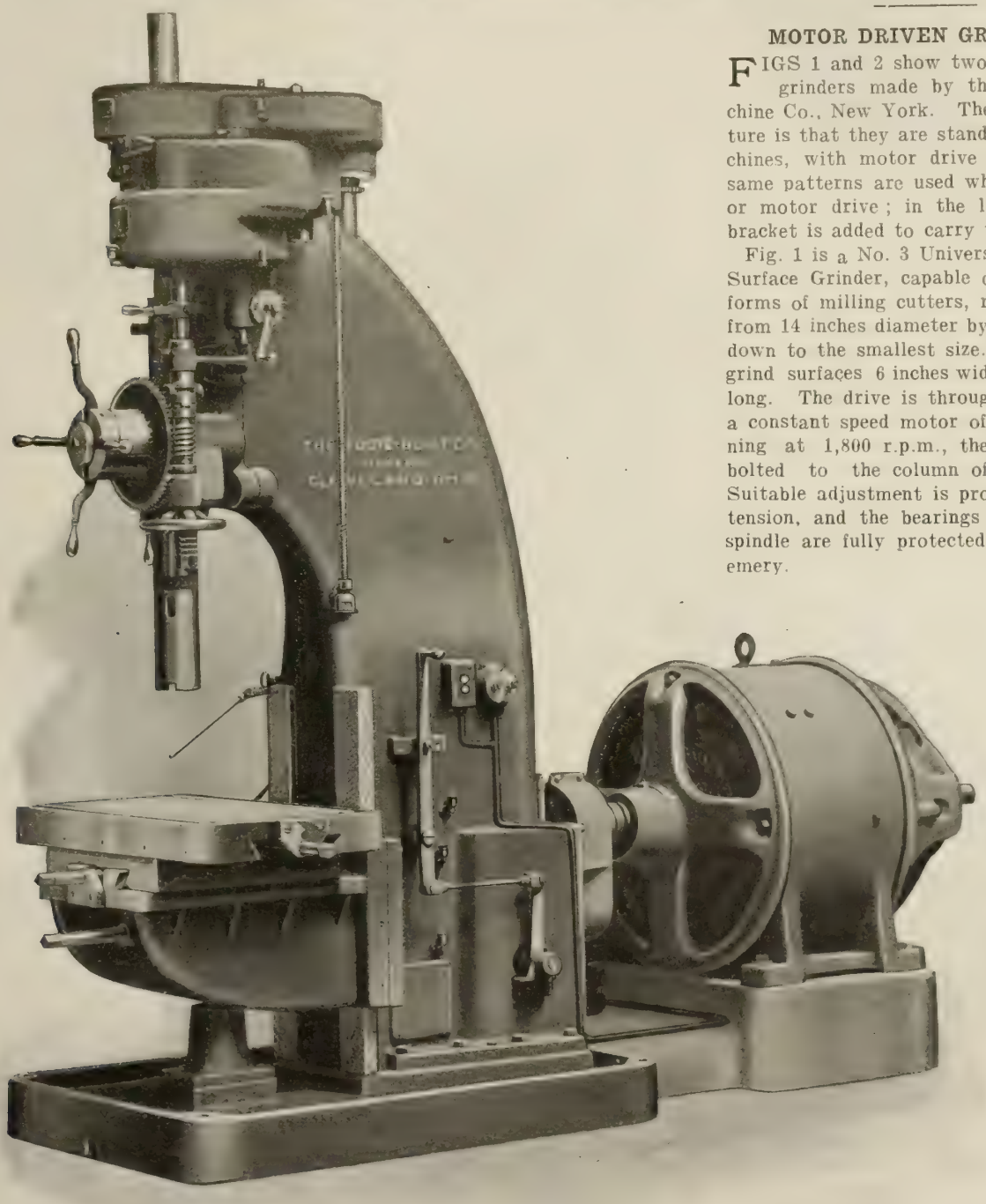
Valley City Wood Surfacer.

worm gearing. The quick traverse of the spindle in either direction, is attained through a spider hand wheel located in front of the machine, which with either the "in or out" movement of any or all of the handles, engages or disengages same.

The table is of the bracket knee type, and has, a large square lock-bearing surface on the upright to which it is securely gibbed. It is further supported and elevated by a square thread telescopic jack screw, located underneath, and slightly back of the spindle, to permit boring bars or other tools passing through the table. The motor drive consists of a 20 h.p. four-to-one variable speed motor, geared direct with a two-to-one reduction. Back gears give a further gear of four-to-one, and make possible, spindle speeds varying from 37½ to 600 r.p.m.

A compound table can be fitted, if desired, and is not an attachment to the regular table, but consists of an entirely new knee. This compound table has a longitudinal movement of 14 inches and a cross movement of 8 inches. The distance from centre of spindle to face of column is 18 inches, and the maximum distance from the table to the nose of the spindle is 31½ inches with the standard table, or 5¾ inches less with the compound. The length of the power feed is 16 inches, and the net weight of the machine, 7,000 pounds.

The table under the heading, "Recent Drilling Records," shows the remarkable results obtained when carrying out the already-mentioned test. With one exception the drills used were the Cleveland Twist Drill Co.'s "Paragon" flat twisted high speed type. It will be noted that the 1¼ inch size, drilled cast iron at the rate of 57½ inches per minute constituting in this respect the highest drilling speed on record.—See page 211.



FOOTE-BURT HIGH DUTY DRILL PRESS.

MOTOR DRIVEN GRINDERS.

FIGS 1 and 2 show two motor driven grinders made by the Garvin Machine Co., New York. Their special feature is that they are standard stock machines, with motor drive applied. The same patterns are used whether for belt or motor drive; in the latter case, a bracket is added to carry the motor.

Fig. 1 is a No. 3 Universal Cutter and Surface Grinder, capable of grinding all forms of milling cutters, ranging in size from 14 inches diameter by 6 inches face, down to the smallest size. It will also grind surfaces 6 inches wide by 9½ inches long. The drive is through a belt from a constant speed motor of 1-6 h.p., running at 1,800 r.p.m., the motor being bolted to the column of the machine. Suitable adjustment is provided for belt tension, and the bearings of the main spindle are fully protected from floating emery.

The weight of this machine is 435 pounds.

Fig. 2 shows a surface grinder driven in like manner. The motor is mounted



Fig. 1—Garvin No. 3 Universal cutter and surface grinder.

on two steel arms bolted to the side of the column, on which is the track for motor adjustment, to maintain correct tension in the lower belt. The upper looped belt, driving to the spindle has also a compensating tightening device. The motor is of the constant speed type, ½ h.p., running at 1,650 r.p.m., and the machine will grind surfaces 7 inches wide by 9½ inches long and of thickness from ⅛ to 6 inches. The total weight is 450 pounds.

When such machines are located in isolated places, and a live shaft drive is not available, an easily applied motor drive is of special value. Further, being easily portable, they can be set down in any position.

GARVIN PLAIN MILLING MACHINE.

We illustrate herewith the No. 22 plain milling machine, built by the Garvin Machine Co., New York. It is the most powerful and largest capacity machine they make, and has been designed for continuous hard work; all non-essential parts having been dispensed with.

The spindle has a No. 11 Brown and Sharpe taper hole with driving slot, and runs in adjustable bronze boxes. The drive is by means of a 12-inch cone and 4-inch belt, the gear ratio being 5¼ to 1.

From Fig. 1 a new departure will be noted. One side of the machine is closed; so that the arm and spindle bearings are joined rigidly together and to the body of the machine, thus securing great solidity and freedom from vibration. The feed is driven from a spindle on the back shaft, by throwing over the eccentric seen in Fig. 3. The feed ranges from 1-200 to ¼-inch per turn of spindle

The table is driven by a non-rotating screw and a rotary steel nut, shown in Fig. 4, both screw and nut being hardened. The hand feed is operated by hand wheel and spiral gears running in oil, while the rotary feed nut is driven by a worm gear and worm running in oil.

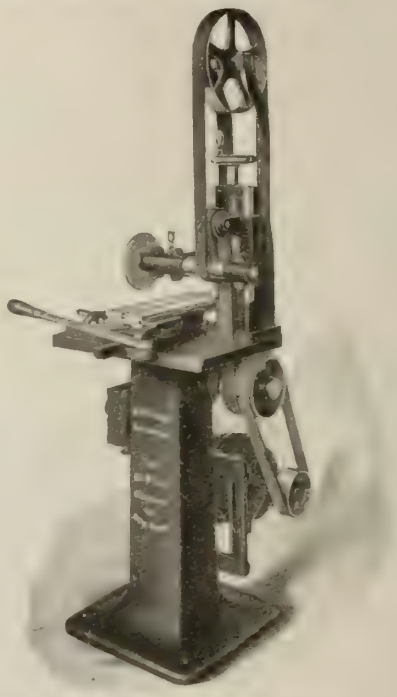


Fig. 2—Garvin surface grinder.

The feed box is built into the saddle, so that the stresses are taken up in the most direct manner with the smallest number of joints. The saddle has micrometer adjustment in and out. The

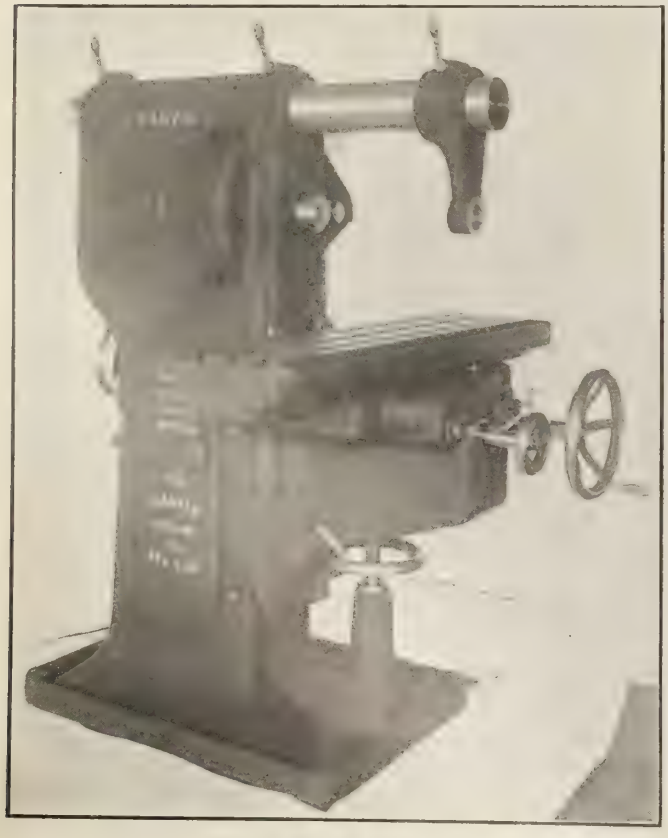


Fig. 1—Garvin plain miller.

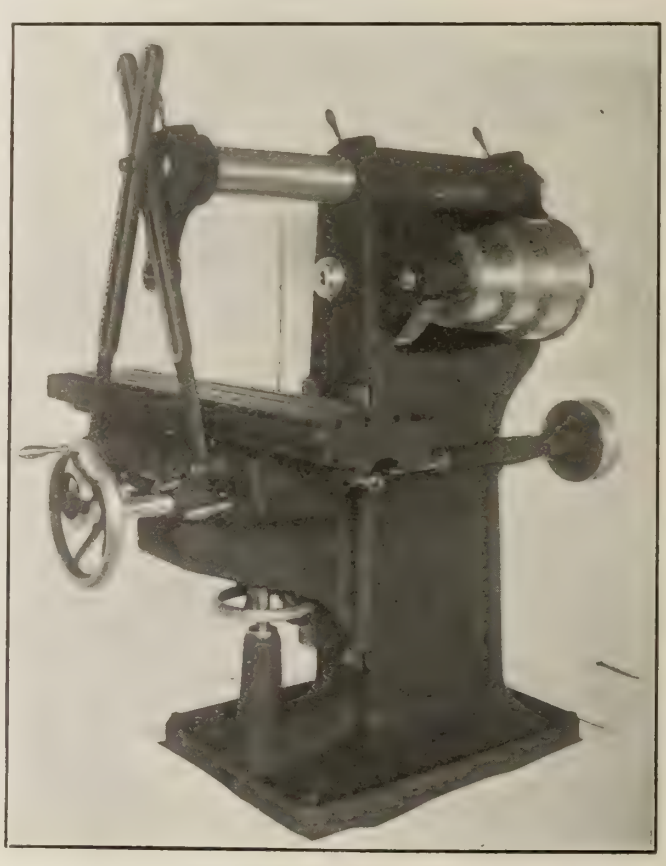


Fig. 2—Garvin plain miller.

knee has the Garvin closed top construction, and is raised by micrometer handwheel and a screw, the latter not passing through the floor. The arm is large and the braces shown in Fig. 2 connect it with the saddle, leaving the yoke free for adjustment to suit the arbor and position of cutter.

HEAVY DUTY DRILL PRESS.

THE 24 inch heavy duty drill press which we illustrate, has lately been re-designed by the makers, the Colburn Machine Tool Co., Franklin, Pa. The machine has a capacity for drilling 3 inch holes in solid steel with high speed drills running at speeds and feeds recommended by the drill makers.

Constructional Details.

In the former design, the drill had a right angle drive, necessitating the use of quarter turn belts, when a number of machines were set in a row and driven from one line shaft. This has been changed, and the main driving shaft in the speed box, on which is mounted the driving pulley, is now parallel with the line shaft. No countershaft is required, all changes of speed and feed being obtained through positive gearing, by means of levers conveniently situated within easy reach of the operator, standing in front of the machine, Fig. 2.

The speed box, of entirely new design, is mounted on a substantial knee at the rear of the main column. Eight changes of speed can be obtained through sliding gears and positive clutches, operated by means of levers, E and Z, Fig. 1. All gears in the speed box are of steel, running in an oil bath, and the corners of the teeth are beveled where they slide together. A target, I, on the top of the speed box, shows which gears are engaged. Four of the speed changes similar to the changes with a selective transmission on an automobile, are made by means of lever E, and a set of back gears operated by lever Z, increases the number of speeds to eight.

The machine drives through a friction clutch pulley, operated by means of lever G. Being a high-speed drill press, with the gears running at a high rate of speed, it is impossible to make the speed changes when driven by the regular clutch pulley, on account of the severe impact caused by too sudden engagement of gears and clutches. To overcome this, an auxiliary friction clutch is interposed between the main friction pulley and the gears in the speed box. This auxiliary friction is operated by means of lever F, and by its use, the gears are made to turn very slowly and the different speed changes can be made without jar or shock.

Operating Features.

The different speeds and feeds, and the combination by which they are obtained, are shown on a speed and feed index plate attached to the feed box in plain sight, and the operation of changing either speeds or feeds is most simple. To illustrate: for 45 revolutions of spindle per minute, the positions are: Lever Z at slow, and the rod Y at A. The machine should be at rest when making changes. The operator first takes hold of lever Z with his left hand and throws it in the direction marked slow. This is the back gear lever and operates one gear and a positive clutch.

If the gears have come to rest so that the teeth will engage, it will not be necessary to revolve them; but if not, the operator takes hold of lever F with his right hand and pulls gently. This operates the auxiliary friction clutch and causes the gears to turn slowly, until they can be brought into engagement.

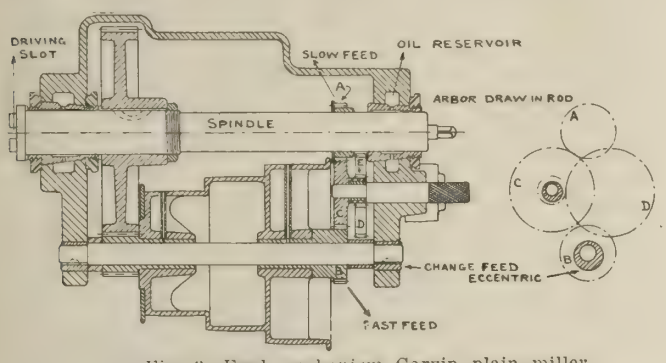


Fig. 3—Feed mechanism Garvin plain miller.

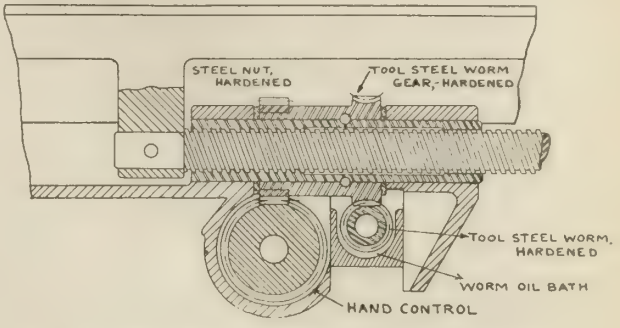


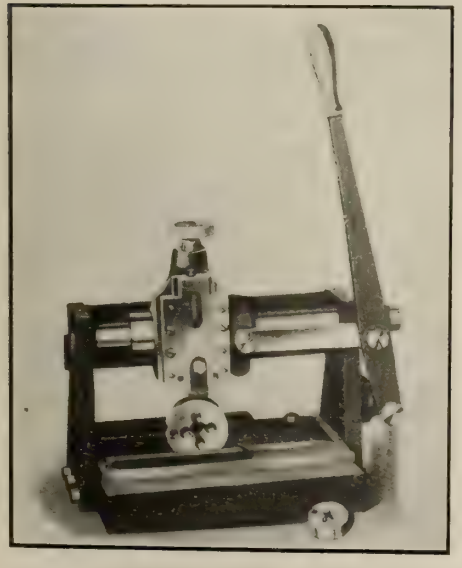
Fig. 4—Table driving screw, Garvin plain miller.

MARKING MACHINE.

IN shops manufacturing taps, dies, drills, or in any plant where letters or figures have to be stamped on the product, a marking machine such as we illustrate is almost indispensable. Besides making a much more uniform impression than can be obtained with the usual steel stamps, the work can be done much quicker on a machine.

The pressure is obtained through a powerful toggle lever, and the head of the machine is provided with means for quick vertical adjustment, to allow for varying thicknesses of stock being stamped. There is also a stop arrangement to regulate the horizontal movement. This machine has a capacity of 1,800 pieces per hour, and is adapted for straight stamps on round work, and circular stamps on flat work.

The makers are the Remington Tool and Machine Co., Boston, Mass.



Remington marking press.

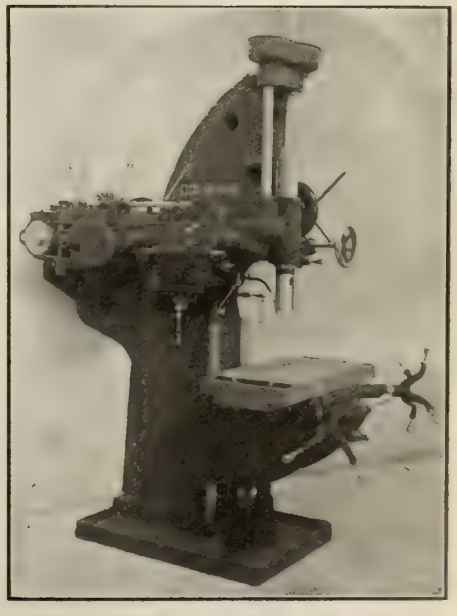


Fig. 1—Colburn heavy duty drill press.

The speed at which the gears are turned by the auxiliary clutch can be regulated by the pressure on the lever F, and thus any danger of damage to the mechanism is entirely eliminated.

The position of the two rods Y, is indicated by pointers traveling across the face of a target having the letters B, A, C, D. The front rod Y, has a pointer which indicates its two positions C and D, while the rear rod Y has another pointer, indicating its two positions B and A.

The lever E has a pin which engages slots in the two rods Y, Y. By sliding the lever backwards in its bearing H, the pin enters the slot in the rear rod Y, and by sliding the lever forward, the pin enters the slot in the front rod Y. Only one of the rods can be moved at one time, and the pin cannot be moved from one rod to the other, until both are in neutral positions; this being accomplished by a strip of metal fastened rigidly between the two rods, with a single slot through which the pin will just pass. To change the pin from one rod Y to the other, it is always necessary to bring the slots in both rods opposite the slot in the center strip. With the rods in these positions, the sliding gears are not in mesh. Consequently there is no chance for the gears to fight, and the device is fool proof.

If the gears do not slide together in the position in which they come to rest, the operator will take hold of lever F and with a slight pressure, gently revolve them, when they can by means of be thrown into engagement by means of lever E. The actual sliding of the gears is accomplished by right and left movements of the lever E, while changing of the pin which moves the rods Y, Y, from one to the other, is accomplished by sliding the lever through its bearing H. Often after the machine has been stopped, the gears or clutches can be engaged without using the auxiliary clutch lever F, but whenever the teeth do not engage, a slight pressure on this lever causes them to turn into the correct position.

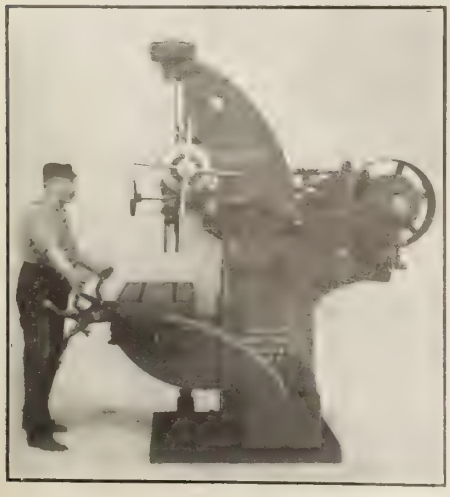


Fig. 2—Colburn heavy duty drill press.

Speed and Feed Changes.

The feeds, of which there are six, are obtained by means of the pull rod X operating the back gears, and the pull rod W operating the dive key. To change the feeds on the high speeds, it is advisable to stop the machine and proceed as for changing speeds, but when running on the slow speeds, the machine need not be stopped to change the feeds. The whole operation of speed and feed changing is extremely simple and is quickly made. By looking at the index plate, the operator can see at a glance just what to do to get any desired speed or feed, or he can tell at just what speed or feed the machine is running, by noting the positions of the levers and rods and comparing them with the index plate.

"CANADIAN FOUNDRYMAN."

"Canadian Foundryman," devoted to the foundry, patternmaking, polishing and plating interests, contains each month, bright helpful articles and news concerning the doings and achievements of manufacturers and operators in their respective fields. Readers of Canadian Machinery will find it of invaluable assistance in acquiring a knowledge of kindred trades, at low cost.

Spindle and Drive Equipment.

The spindle is of forged high carbon steel, the thrust being taken on ball thrust bearings. It has a No. 5 Morse taper at the bottom and a total travel of 16 inches. Direct feed on spindle is through a worm gear carrying a graduated dial, reading in thirty-seconds of an inch. The graduations being about $\frac{1}{8}$ inch apart, a finer measurement than 1-32 inch can be made by reading between them. This dial has an adjustable pawl, which can be set to automatically trip the feed at any point up to 14 inches travel of the spindle. The feed can also be tripped by hand. In addition to the above graduated feed dial, there is another safety trip which automatically stops the feed when the spindle has reached its lowest position, thus preventing possible accident on account of feeding down too far.

The machine is built with either the standard bracket type of table as shown in Fig. 3, or with a compound table as

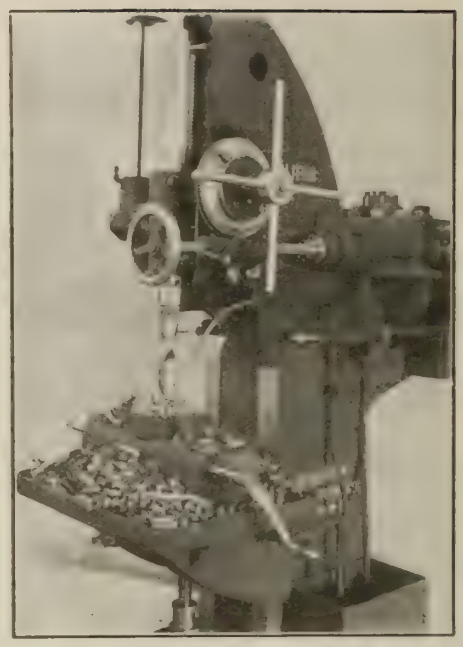


Fig. 3—Colburn heavy duty drill press.

in Figs. 1 and 2. Both tables have a telescopic elevating screw which eliminates the necessity of making a hole through the floor. Special chucks or other fixtures may be mounted upon either type of table. In Fig. 3 is seen a two jaw universal chuck, specially adapted for holding gear blank forgings and similar work. The jaws are made detachable and special styles can be fitted for irregular shaped pieces. The illustration shows a 2½ inch high speed drill, boring a steel gear blank at a feed of 4 inches per minute.

To adapt the machine for motor drive a special bed plate having an extension for the motor is provided. The motor is located directly under the clutch pulley, to which it is belted. The clutch pulley of course allows the machine to be stopped and started without stopping the motor. A constant speed motor is used, of from 10 to 20 h.p., depending on the work to be performed.

JAPANESE RAILROADS.

The manager of the Japan Rolling Stock Co. (Mihon Sharyo Kaisha), recently stated that a large amount of rolling stock will be required in Japan in the near future, as a result of the extension of the government railways, and it is estimated that by 1923, 500 locomotives, 750 passenger coaches, and 9,300 freight cars will be placed on these lines, necessitating an aggregate expenditure of about $12,500,000 to $15,000,000. In addition, considerable quantities of stock will be required for the lines built, and will be constructed by private companies, of which 17 or 18 were organized last year.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

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Vol. VII. August, 1911 No. 8

TIME LIMIT FOR TENDERS.

IN our view, the period allowed from the date of publication, or receipt of tender forms by the contractor or his representative, is in most cases totally inadequate, and seems in addition to bear no proportion whatever to the amount of contract price involved. Surely in such matters, opportunity should be given to go carefully into the requirements called for, by all desirous of submitting a quotation, as only thereby will fair competition have its rightful stimulus, and the best possible equipment be secured at the best possible price.

Much of the discussions on higher efficiency hinge on the workman's pay roll, his output in relation to it, and but little is heard of inefficiency otherwise. In the broad outlook, large opportunity awaits these efficiency experts' attention, as in this particular phase of "open tender," we believe betterment and all-round benefit to be derivable. Doubtless, most concerns in whose particular lines these large contracts lie, are so organized as to be able to figure closely and rapidly; still even these, we think, would perhaps feel more secure in their price, and reap a larger profit, were the time allowance extended.

THE MECHANICS' EDUCATION.

A CAREFUL perusal of the contents of the current issue of "Canadian Machinery," will convince the most sceptical, as to the earnestness of desire and effort put forth by manufacturers and others concerned, in the direction of providing sound, practical and technical training to all willing to avail themselves of it.

At the recent Conference on "The Education of Engineers," held in London, England, (the first section of a report of which appears in this number) it is abundantly clear that employers are fully alive to the question, and are actively propagating the work. "Education of Engineers" is a term used in its widest sense, and, therefore, includes among the others, all engaged in Machinery and Machine Tool manufacture. A feature of much importance at this Conference, was the opportunity afforded, what might be termed the purely educational interests, to get into close touch with employers of large engineering works. There has always been a more or less want of community of interest existing between these two sections, in the mechanical development of those under their care, and we believe much good is likely to result from the personal interchange of ideas.

Men or youths who aim to make progress in their chosen profession of Mechanical Engineering, should take advantage of every form of education that will better equip them, and the University, Technical School, Works Educational Schemes, (where such exist) will all be found powerful helps to the daily shop practice. In Canada, there are already large, well-equipped colleges, covering to a large extent the higher branches of an engineer's education, and the steps being taken to supplement those by establishing Technical Schools in all industrial centres, will enable an increased number to take advantage of, and benefit by their combined services.

CONVEYING YOUR IDEA TO ANOTHER.

THROUGH the lack of the knowledge necessary to convey their idea or invention to paper, in writing or drawing, many men have been denied the reward which would otherwise have come to them. It is noticeable that lack of capacity in the former respect, causes mistrust of those who could put the ideas in intelligent form for them, and this circumstance of itself is sufficient justification for the plea in favor of more particular attention being paid to the acquirement of at least a fair measure of mechanical drawing and sketching.

Most men, imbued with a liking for their work, have dreamings of improvements in the methods adopted and the means employed; and who, more than the operator, has a better opportunity of seeing them assume the form of practical possibility. This being so, should it not be the earnest endeavor of every machinist, and the younger generation of them especially, to so equip themselves, that whatever they divine as an advance and improvement on existing practice, may be committed to paper at their own hands.

The ability to put one's ideas on paper, has the further advantage that more effect can be given to the particular scheme being developed, because of the concentration obtainable. Sketching machinery details and afterwards drawing same to some scale, will familiarize those who practice it with such all-important points as the securing of necessary dimensions and views, from which another may be able to work. Those deficient in the art of drawing and sketching, and who persist on that account in withholding the privilege of committal by another of their ideas to paper, are more numerous, perhaps, than we might at first sight credit, and being so, mechanical progress is held back, on account of these men, in course of time, dying off, and taking what was of value to all, with them.

WRITING TO TRADE PAPERS.

Zeal is generated and stimulated to know and find out more, by writing trade or business articles, and what a man acquires in this way is invaluable, because no matter how much of his knowledge he gives away to others in his writings, his own store becomes no less, but as a matter of fact, does really increase.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

BEFORE going further into the making of detail drawings, it will be necessary for us to consider how an object may be represented by a series of views, bearing a definite relation to one another. Take for instance, a common brick. This has three dimensions, length, breadth, depth, therefore the drawing will consist of such views as will give all necessary information.

Different Views and Locations.

Fig. 1 shows a drawing of the brick, which is 9 inches long, 4½ inches wide,

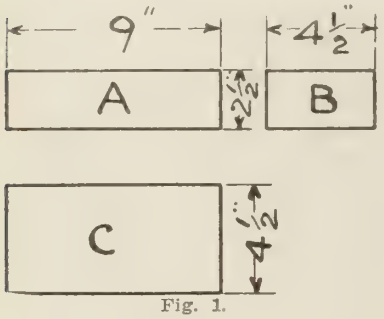


Fig. 1.

and 2½ inches thick. A is known as the front elevation, and is a view of the brick as it would appear in the face of a wall. B is a view looking at one end, and is known as the end elevation. C is a view looking down upon the top of the brick, and is known as the plan or plan view.

Fig. 2 is a perspective drawing of the same object, and from the letters, it can be easily seen which face of the brick is represented in each of the three views of Fig. 1. Thus to obtain the end elevation B, we turn the object through an angle of 90 degrees to the right; similarly, the plan view is obtained by turning it through 90 degrees downwards. This is the simplest system, although there are others in common use. For instance, some draftsmen would place the plan, C, above A, instead of below it, and would place the end elevation B to the left of A, instead of to the right. In this instruction course we will adopt what to us appears the simplest plan —that first described.

The question may be asked, why three views as in Fig. 1, when all the dimensions can be clearly shown in one view as Fig. 2? A little consideration, or better still, a little experience, will show that a perspective drawing would be too inconvenient a method of representing a complicated casting, or in fact, anything but a simple rectilinear object. Consequently, the method shown in Fig. 1 is adopted and is known as the method of orthographic projection, or projection by straight lines. We shall learn more of this later on.

Number of Views.

Referring again to Fig. 1, the front elevation A, shows us that the length of the brick is 9 inches, its thickness 2½ inches, while the end elevation B, shows that its width is 4½ inches. We have, therefore, learned all three dimensions from two views. The plan C is required nevertheless, as it tells us that the corners are square, whereas they might be rounded for all we learn from A and B.

It must not be supposed that three views are always sufficient or necessary, to clearly show the construction of any article. Frequently it is necessary or useful to show four or five views, to enable some complicated object to be more easily understood. Mechanical drawing is a language by means of which the draftsman conveys his ideas to the mechanic, and as in other languages, the more complex the subject, the greater the number of words (views) needed to describe it.

Dotted lines tend to make a drawing confusing and difficult to read, and should not be used more than absolutely necessary, although it is of course impossible to eliminate them altogether. Such things as cylinders and hollow castings, or forgings of all kinds are usually shown most clearly by making one or more views known as "sectional views." A sectional view is that which would appear were the object cut through a certain plane.

Explanatory Example.

In making a drawing of a cast-iron tank, with outside dimensions, 24 inches long, 20 inches wide and 14 inches deep, let us assume that the body metal is everywhere 1 inch thick, and that 9 inches from one end, there a partition ¾ inch thick, extending to within 2 inches of the tank top, and having a 2 inch hole on the longitudinal centre line, 7 inches down from the top. A scale of three inches to one foot, or one-quarter

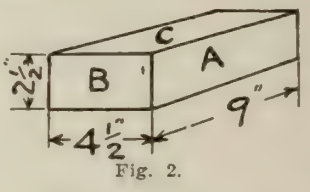


Fig. 2.

full size, will be a suitable scale for the drawing.

Starting with the front elevation, the first step will be to construct by use of tee square and set square, a parallelogram equal to the outside length and depth of the tank. Next, dot in the lines representing the thickness of ends, bottom and partition. The partition, be it remembered, is ¾ inch thick, and stops

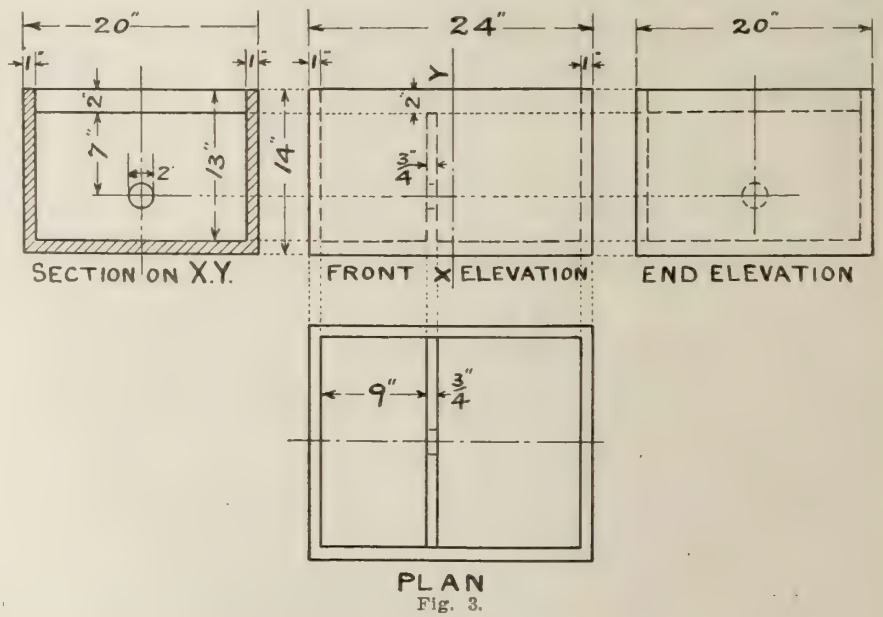


Fig. 3.

*Fifth of a series of an instruction course.

short 2 inches from the tank top. Seven inches below the top of the partition, draw a short horizontal line to represent the centre line of the hole required there, and one inch on either side of it draw a dotted line through the partition representing the edges of the 2 inch hole. This completes the front elevation. We next proceed to draw the plan immediately below it, and here instead of measuring off the length of the tank again, you simply bring the working edge of the tee square about 6 inches below the bottom line of the front elevation and with your set square, produce the end lines of the tank downwards

Draw the lines for the thickness of the ends and the partition in like manner. Now draw a horizontal line about one inch below the lowest line in the front elevation, to represent one side of the tank. Next, set off a distance of 20 inches, along one of the end lines and through the point thus obtained, draw another horizontal line to show the other side of the tank. Inside these two lines, draw two more lines representing the 1 inch thickness of the sides. The plan is now complete, except for the two inch hole in the partition, and which is put on the centre line of the plan as already described, when drawing the front elevation. The height of the end elevation is projected across from that of the front, by means of the tee square, and a vertical centre line is drawn, on each side of which half the width of the tank is set off.

A section on XY, is shown to the left, chiefly as an example of what a sectional view is.

Assume the tank to be cut in two at the line XY (front elevation), then an end view at the line of section would appear as shown. In future lessons, the usefulness of sectional views in eliminating dotted lines, and enabling one to form clearer ideas of the construction of hollow pieces, will be further considered.

AMERICAN FACTORIES IN CANADA.

In the absence of government statistics showing the number of American factories which have established branches in Canada, the Montreal Star, after a careful canvass, reports a list of no less than 184 with a combined estimated capital of $233,000,000.

The products of these branch factories include, among other things, agricultural implements, electrical machinery, malleable and gray iron castings, gas engines, saws, and tools, conveying and mining machinery, railway iron and steel work, chains, automobiles, horseshoes and nails, transmission machinery, stoves, lumber, barrels, boxes, office furniture, couches, folding beds, silverware, paints, oils, varnishes, printing inks, fountain pens, cereals, confectionery, self-sealers, silk thread, paper, roofing paper, gum, gas, fly paper, chemicals.

Some of these are well known and their coming has been widely announced. The city of Hamilton alone has 15 branches, while in Montreal there are 19, and in Toronto 63. There are no statistics showing the number of persons employed, but it is clear there are many thousands. Two factories in Hamilton alone employ 5,000.

WORKMEN'S COMPENSATION.

The Court of King's Bench in appeal, has rendered judgment in a case under the Workmen's Compensation Act, which will probably have considerable effect in shaping the views that judges will take in applying the measure to cases coming before them. The law in question is a new one, and applies to the cases of employer and employe within limits and on principles not otherwise recognized. These are fairly set out in the judgment to which reference is made.

A young man was engaged to do certain work for a quarry company. In moving from one part of the works to another, a day or two after his engagement, he loitered at a place where he had no occasion to be. He was warned by the foreman in charge of operations to move, and had hardly retorted that he was in no danger, when an accident happened and he sustained such injuries that death followed. Suit was brought by a relative for compensation on the ground that the deceased was her sole support. There was no apparent question as to what were the facts. The contributory carelessness or neglect of the victim, was not a bar to the claim made upon the employer. The liability of the latter was held to exist when there was a relationship between the work of the employe and the accident which injured him.

To quote the words of Mr. Justice Archambeault, speaking for the majority of the court, "To come under the act it appears * * * unnecessary that the workman should be at a precise spot assigned to him. From the moment one of the cogwheels of the machinery of which, so to speak, he is a part, causes an accident, the accident happens in the course of the work, or professional risk, and the employer is liable." After accepting this view the court had only to decide on the amount of damages it would award. The law fixes $1,000 as the minimum in case of death, with $2,000 as the maximum, but it gives the court power to reduce the amount, where the mishap is due to the inexcusable fault of the workman, and to increase the allowance where there has been inexcusable fault by the employer.

The court under this authority, fixed $500 as the sum to be paid to the plaintiff, indicating that the victim of the accident was responsible, and, to a certain extent, that his employer was not. This judgment the Court of King's Bench upholds.

The advantage of the Compensation Act to the employer is presumed to lie in the fact that by it, so far as it applies to his employes, his liability is definitely fixed. As this case illustrates, it may be larger than was generally anticipated. A law on similiar lines in Great Britain has worked to considerably increase the demands upon employers of labor, and though liability underwriters have increased their rates for insurance, not many of them have found their business profitable. It would appear that the same experience will be noted in Quebec.

TECHNICAL EDUCATION COMMISSION.

Gilbert M. Murray, the manufacturers' representative on the Royal Commission on technical education and industrial training, has returned from Europe, having left his colleagues at Zurich, Switzerland.

The commissioners went first to London, England; then to Manchester, Leeds, Halifax, Bradford, Glasgow, Edinburgh, Hull, and Leicester. Crossing to Germany, they visited Berlin and Munich, and then began their tour of Switzerland. Zurich was the first stop for observation, and the end of Mr. Murray's European itinerary. The other commissioners, however, were to make further investigation elsewhere in Germany.

A trip to the United States will be made before the report of the commission is completed.

The Smart-Turner Machine Co., Hamilton, have recently filled the following orders:—The Tug Salvor, of Port Arthur, one pump; the Wells Pattern & Model Works, Toronto, side suction centrifugal pump; Gunns, Ltd., West Toronto, side suction centrifugal pump; the Rogers Cheese Co., Frankford, Ont., Duplex pump; the Cronmiller-White Brewing & Malting Co., Port Colborne, Duplex double acting power pump; the Monarch Knitting Co., St. Thomas, automatic feed pump and receiver; the University Power House, Toronto, Duplex pot valve pump; the Canadian Colored Cotton Co., Hamilton, Duplex pump; Canada Coating Mills, Georgetown, single vacuum pump; the International Harvester Co., Hamilton, side suction centrifugal pump; L. J. Looby, Owen Sound, side suction centrifugal pump; the Acheson Oildag Co., Sarnia, couple of pumps; the Burrill Lumber Co., Three Rivers, P.Q., Duplex boiler feed pump.

Boiler Design, Construction, Operation, Repairing and Inspection

By H. S. Jeffery

The Various Points in Connection With Boiler Practice Will be Clearly Taken up In This Series. The First Article Dealt With the Boiler Shell, Including Repairing, Factor of Safety, Hydrostatic Test and Number of Courses. The Series Will be a Complete Text Book on the Subject of Boilers, and Should be Preserved for Reference.

Bracing.

All boilers, especially tubular boilers, are so constructed that a part is self-supporting. The shell is self-supporting because the force acting upon it tends to maintain a circular form. It is also true that the flues of a tubular boiler are subjected to pressure at all points, but

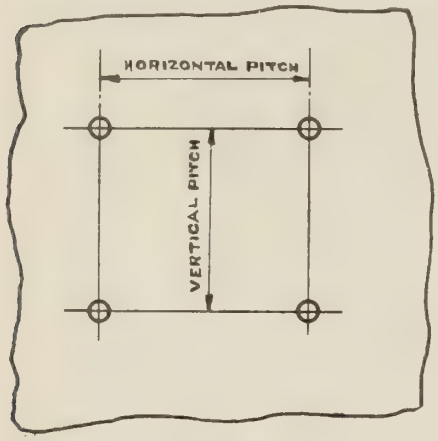


Fig. 34.

the pressure on the shell is internal and that on the flues external, except in the case of water-tube boilers, where the flues are subject to internal pressure.

Parts of the boiler that are not self-supporting must be stayed or braced in a manner which will prevent deformation or bulging when the boiler is in service. There are many ways of bracing boiler parts; the water space of locomotive and similar types of boilers is stayed with staybolts. With staybolts, attention must be given to three things: (1) the area supported. (2) The size of the staybolt. (3) The thickness of the plate supported.

The area is computed by authorities differently. If the staybolts are pitched 4-inch centres, the area would be 16 square inches, and all authorities so figure, but if they are pitched 3¾ x 4 ins., most authorities would figure the area to be supported as 4x4 equals 16 square inches. This rule requires staybolts to be distributed in such manner that the distance between the vertical and horizontal rows will be as nearly uniform as practicable—that is to say, if the staybolts were pitched, say 3½x5 inches, the area supposed to be supported by each staybolt would be equal to 5 squared, or 25 square inches. The area is usually computed by the following formula:

$$\frac{C \times T^2}{D} = P$$

Where:

C=Constant (See note).

T=Thickness of plate in sixteenth of an inch.

P=Working pressure.

D=Greatest pitch of staybolts.

Note: The constant depends upon the thickness of plate and also the authority.

In selecting the size of staybolt, one of the first things to consider is the thickness of plate which the staybolt is to support. Now the staybolt may be sufficiently large to support the area allotted to it and the pitch may be about the usual pitch, 4 inches, yet the plate may be so light that the pitch is excessive. This is illustrated by the arrangement, Fig. 34. Assuming the constant to be 110 and pitch 4 inches, the allowable working pressure for a ¼-inch plate would be, $\frac{110 \times 16}{16} = 110$ pounds, and for a ⅜-inch plate, $\frac{110 \times 36}{16} = 247.5$ pounds.

It will be seen by the above that the ⅜-inch plate, while only ⅛-inch heavier, is allowed a much greater working pressure. Further, the size of the staybolt has not been considered—the working pressure has been determined only. The staybolt diameter depends upon the allowable stress per square inch. Since staybolts are subjected to both a direct pull and a vibratory stress, their factor of safety is considerably higher than that of the boiler shell. Again, the threads of the staybolt open avenues for the starting of cracks and as the least area eaten away by corrosion reduces their strength materially, the usual stress allowed is 6,000 pounds per square inch.

With the ¼-inch plate in the foregoing example, the load on the staybolt will be: Area × pressure or 16×110= 1,760 pounds. Dividing by the allowable stress per square inch, the area required will be:

$$\frac{1{,}760}{6{,}000} = .293 \text{ square inch.}$$

The diameter of the staybolt at the root of the thread is then:

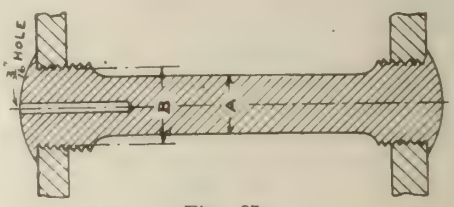


Fig. 35.

$$\frac{.293}{\sqrt{.7854}} = .614, \text{ say } \tfrac{5}{8}\text{-in. diameter.}$$

All staybolts are not threaded their entire length—some are "skinned" out as indicated in Fig. 35. This staybolt has a small 3-16-inch hole in one end, and is a practice used extensively with locomotive boilers, the purpose being to give an alarm by escaping steam when fracture takes place. As staybolts nearly always break at or near the outer wrapper sheet, the tell-tale hole is installed in the end attached to said sheets.

When a staybolt is so "skinned" and the tell-tale hole installed, the area at diameter A, Fig. 35, is ascertained, also the area at diameter B less the area of the tell-tale hole. The lesser of the two is the net area of the staybolt. Usually staybolts are "skinned" out sufficiently that the least area is that from the diameter A.

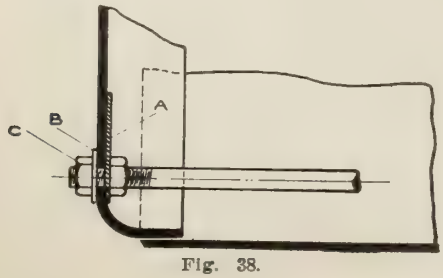


Fig. 38.

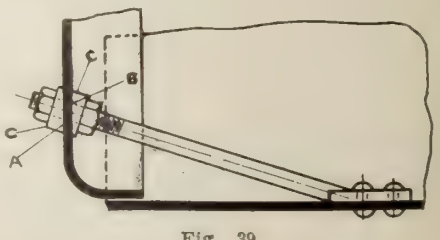


Fig. 39.

It is important to note that staybolts do not always support both sheets to which they are attached. The furnace of an upright boiler is stayed; and the stays are by necessity attached to the shell sheets. Staybolts should be placed at right angles to the surface they support, or as near as practicable. If the staybolt is supporting a curved surface, it should be placed as radiating from the apex of the curved surface. Curved surfaces which are not self-supporting are stayed the same as flat surfaces. The fact that the furnace of an upright boiler would successfully resist 30 pounds steam pressure without staying is not taken into consideration if the boiler is to be constructed and stayed for 100 pounds steam pressure, and the size of the staybolts, their pitch and the thickness of the plate is computed without regard to the curved surface.

When bracing the segment of a boiler, the braces cannot be spaced uniformly. This is illustrated in Fig. 36, where it will be noted that there are three rows of braces and the pitch is 5 by 8¾ inches. Unlike staybolts, the area supported by a brace is computed as the minimum pitch times the maximum by most authorities, and in this instance: 5×8¾ equals 43¾ square inches. Other

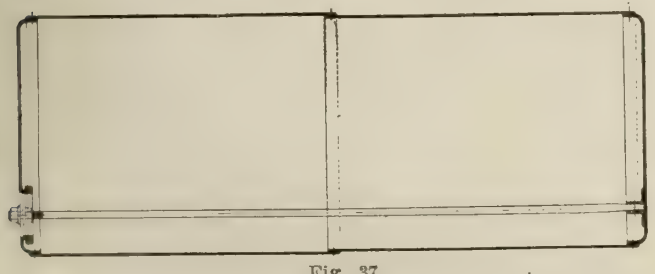


Fig. 37.

authorities used a split-the-difference method as follows:

$$\frac{5^2 \times 8.75^2}{2} = 50.78 \text{ square inches.}$$

The rule used for the rivets is the same as for the staybolts. Example: The distance between the rows of braces, Fig. 36, is 5 inches, while the pitch of the rivets is 4 and 4¾ inches, respectively. This makes three different rivet pitches, 4, 4¾ and 5 inches, respectively. Practically all authorities would figure the area supported by the rivet as: 5×5 equals 25 square inches. It will be seen that to determine the size of brace, necessitates knowing just what method the authority having jurisdiction requires. The rivets which hold the brace to the boiler head are treated as far as calculations are concerned the same as staybolts, the area supported by a rivet being calculated as above.

Direct and Indirect Braces.

Direct braces are to be preferred to indirect, yet it is impossible with some boilers to apply direct braces throughout. Diagonal braces should not be placed at an angle greater than 20 degrees, and with a three-course tubular boiler, it is good practice to have some of the diagonal braces attached to the centre course. The diagonal brace length multiplied by the area of a direct brace required to support the surface, and divided by the length of a line drawn at right angles to the surface supported and to the palm of the diagonal brace, gives the diagonal brace area. Formula:

$$\frac{S \times L}{B} = A.$$

S=Sectional area of direct stay.
L=Length of diagonal in inches.
A=Sectional area of diagonal brace.
B=Length of line drawn at right angles to boiler head or surface supported to palm of brace.

Example: The diameter of the direct brace is 1 inch, length of diagonal stay 60 inches, line drawn at right angles, boiler head to palm of brace 48 inches. What is the sectional area of indirect brace?

$$\frac{.7854 \times 60}{48} = .981 \text{ square inch, say } 1\tfrac{1}{8} \text{ in.}$$

In Fig. 36, the manhole below the tubes permits entrance into the boiler for the purpose of inspecting, cleaning, and repairing; and necessitates bracing the heads there. This is accomplished in several ways. The front head with the flanged hole is supported by same, yet many require the ring A to be shrunk on. A method of staying, is to apply angle irons to the rear head and fit 2 end-to-end stays as indicated in Fig. 37. Some stay the flues, attaching a liner to the rear head instead of angle iron, and fitting 2 end-to-end stays as indicated in Fig. 38.

The method, Fig. 37, is superior to that in Fig. 38, for the reason that the liner A, Fig. 38, makes a double thickness of plate at a part of the boiler in contact with hot gases. In Fig. 37, the water is in direct contact with the greater portion of the flue head. Further, the nut C and washer B, Fig. 38, will hardly be indirectly cooled by the water in the boiler and will soon burn off. One difficulty with the angle irons, Fig. 37, is that the space for the eye of the end-to-end stay becomes clogged with mud. The manhole in the front head permits this to be watched, however, so there will be no accumulation to the extent that the boiler head will be over-heated and deformation take place.

A brace used to some extent for the segment above the tubes, but rarely below the tubes, is shown in Fig. 39. It is not a good brace as the hole in the flue head is made larger than the brace by at least ¼-inch and when the brace is installed there are openings above and below as indicated by the letters A and B. The bevelled washer C does not bear fairly against the plate at every point, and although the spaces A and B

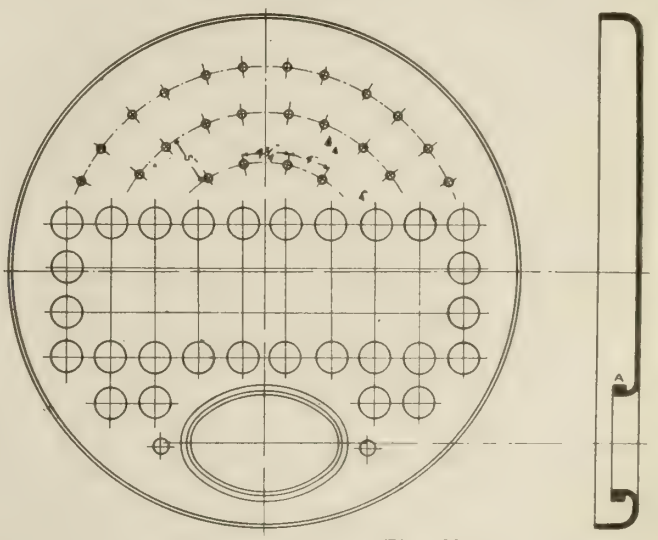


Fig. 36.

are "packed," the packing in time works out and the brace leaks.

A man, like a knife or a saw, can have too little temper as well as too much. We should not be soft enough to batter and turn easily, nor hard enough to crumble or break. It frequently behooves one to try and fit his temper to the services he wishes to render.

In the August issue of MacLean's Magazine is a contribution in which the writer claims that Earl Grey is right in attacking us—although he should attack more than Canada—and that at the same time the Public Schools are right in saying that they are not solely to blame. The trouble is from a much deeper source. The Canadian people should try to find the cure. This article hints at it.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

THE HANDLING OF MEN.

THE following abstract from a letter of G. O. Griffith, of Fort Flagler, to a contemporary will be found of interest to our readers.

"In the management of men to get the best results, the man in charge must have their respect. To get this, he must treat them as men who are in no way inferior to him, except in the matter of work. There are men working in lower positions than they should be, because some one higher up does not appreciate their work, and does not therefore give them their just dues. Every chief should watch and study his men, and when one shows that he is competent and deserving of advancement, the chief should give him what he deserves, and show no favoritism.

"Fair treatment will get better results than unjust treatment. Men dislike a person who is always 'cussing' and 'grouchy' with them, and they will not do as good work when he is away as they would otherwise. Of course, there are men who will not benefit by good treatment, and with such a man, he has either to be got rid of, or be made understand that he will have to do as he is required.

"Perhaps nothing will make a man slight his work so much when he gets the chance, as abusive language. Most men like to have their work praised occasionally."

THE SMALL MACHINE SHOP.

By H.S.G., Toronto.

IN these days of keen business competition, when success depends so much upon a careful study of system and economy, it is surprising how many of the smaller machine shops are operated with little regard to those details which make for smooth running and efficiency. Of course, the average small shop, besides manufacturing some special line of machinery, has much of its time occupied with a variety of repairs and is therefore not in a position to give much effect to the matter of improved equipment. Every tool has to be a "Jack of all trades," still much may be gained by giving thought to the handling of the employes.

Efficiency of the Employe.

Try to keep each man as much as possible to one machine, as the advantages are many; for each will develop speed at his work, will take a pride in keeping his machine in good condition, and will have at hand the necessary bolts and clamps, so avoiding loss of time and temper.

Do not disregard the suggestions of a reliable workman with regard to the purchase of equipment. If he repeatedly complains of a lack of some appliance to handle his job, it is safe to say, that the resultant saving of time and increase of business would soon repay the outlay on new apparatus.

Keep the tool-room locked, and insist on a check for every tool issued. When system is relaxed, the men help themselves indiscriminately, and not only keep tools out longer than necessary, but cause the number of broken drills, taps, and reamers to mount up at an alarming rate.

Do not let the apprentices pick up everything for themselves. It is easier to acquire bad habits than good and besides, a careful supervision of the apprentices, will save a lot of damage to equipment, and a little encouragement will bring out all the good there is in the young hand.

Consider the comfort of the workers, and provide a room where they can eat their dinners in comfort and cleanliness. Give them proper lavatories, and realise the impossibility of getting good work out of discontented workmen.

"THE POWER HOUSE."

The August issue of "The Power House" will contain a full account of the C.A.S.E. Convention, held at Stratford, Ont., in the latter part of July. All interested in Power Plant Development and Operation will find much to attract them in that special Number, and arrangements should be made to become subscribers and secure a copy.

SAFETY DEVICES ON ELECTRIC CRANES.

OF late years the speeds of electric cranes have been increased considerably, yet the provision of adequate safety devices to prevent over-winding and over-traveling has not always received the attention it merits, although in other applications of electrical power, manufacturers have devoted a considerable amount of time and money to the problem of placing on the market automatic and "fool-proof" devices, designed to secure immunity from accident due to errors of judgment on the part of the workman.

Electrical Equipment.

The electrical equipment of a crane usually includes a main switch and fuses, a branch fuse for each motor circuit, together with a rheostatic controller for each motor, no provision being made to prevent the attendant from switching on the current when the controllers are not in their "off" positions, as is generally done with the most ordinary motor control gear. In several instances, however, the main switch and fuses have been replaced by ordinary, overload circuit breakers, which, in order to be effective in preventing accidents through mistakes of this character, should be of the free-handle type. There is, however, a decided objection to the use of ordinary circuit breakers for this class of work, on account of the fact that very often the controller handles are so operated that a momentary large rush of current is produced, which though not of sufficient duration to do any harm to the electrical equipment is of sufficient magnitude to cause the circuit breaker to open and bring the crane to a standstill. The resulting delays may be only trifling, but in the aggregate they are responsible for serious loss of time, and in foundries and steel works are the cause of other and more serious losses. To avoid this trouble, circuit breakers, when provided, are generally rendered inoperative except under very heavy overloads, and so cease to afford any real protection against overloads of smaller magnitude, which may still be of sufficient duration to have serious effects on the remainder of the equipment.

In a system of control designed to overcome these troubles, the crane control panel is equipped with a main circuit breaker, provided with a low voltage release attachment, and instead of a branch fuse for each motor circuit, there is an overload relay with a time limit device, by means of which a dangerous overload on any particular motor, of sufficient duration to cause overheating or excessive sparking, may be entirely prevented. In addition, each motor controller is electrically interlocked with the circuit breaker, in such a manner that, after it has once been opened by the application of an overload or through any other cause, it can be closed again only when the controllers are re-

turned to their "off" positions and all resistance inserted in the motor circuits. It is thus rendered impossible for the attendants to make any mistake in the proper sequence of operations; and in case of failure of the supply voltage through any cause, there is no possibility of an accident happening through the current being switched on again unexpectedly.

The Need for Control Urgent.

With the high traveling and hoisting speeds now in use, the need for suitable safety devices for limiting the hoisting and traveling motions has become urgent, but so far has met with little response, beyond the occasional addition of a limit switch to the hoisting motion to prevent over-winding, and rarely also, to the traversing motion of overhead cranes to prevent over-running. These switches are generally arranged in the armature circuits of the motors, and with their cable connections, have to be of sufficient capacity to deal satisfactorily with the maximum currents possible in practice. Unlike ordinary circuit breakers, they are not designed for interrupting heavy currents, and there is necessarily a considerable amount of wear and tear if they are brought into operation very frequently.

Such switches have not been generally applied to limit the travel of overhead cranes for several reasons; the principal one being that, owing to the large amount of energy stored in a heavy crane when running at a high speed and carrying a heavy load, it is necessary, in order to prevent the crane from running over the end of the gantry, to arrange the limit switch so that current is cut off from the motors while the crane has yet a considerable distance to travel. The ordinary limit switch breaks the motor circuit entirely, and it is, therefore, impossible to cause the crane to continue to travel beyond the point at which the limit switches operate, although the switch is generally arranged so that it is possible to return in the opposite direction. It is, therefore impossible, in such a case to manouvre the crane anywhere near the ends of the gantry, and consequently a large proportion of the area included between the gantries must remain either unserved or very inefficiently served by the crane.

Limit Switches.

These objections may be overcome by special forms of limit switches, such as have been introduced by the British Thomson-Houston Company, which operate by short-circuiting the low volt release device on the circuit breaker of the crane control panel. One form of this switch is designed for limiting the travel only, and is, therefore, suitable for the hoisting and traversing motions, when the latter is made at moderate speed, as is generally the case. In the case of the traveling motion, which is generally made at a much higher speed, it is evidently desirable that within a certain distance of each end of the gantry it shall be possible to travel in either direction at such a reduced speed, that the current may be cut off entirely, and the crane brought quickly to rest when it is quite close to the end of the gantry, so that there is no danger of over-running. This may be effected by the use of a limit switch, so arranged that when the crane is near the point where an ordinary limit switch would open the circuit entirely, the speed is reduced by the insertion of resistance in the traveling motor circuit, which, quite close to the end of the gantry, is opened altogether.

Another possible source of danger is the attainment of very high speeds when heavy loads are being lowered, and devices are now made which render a mishap of this kind impossible. The objection to very high speeds of lowering is that the motor which drives the hoisting motion may be driven at such a speed as seriously to injure, if not break, the fastenings of the armature coils, an injury which might result in the wreckage of that portion of the crane.—The Times.

HEATING REINFORCED CONCRETE BUILDINGS.

AMONG the many advantages of reinforced concrete the heating proposition is not usually emphasized as strongly as it should be. In discussing this subject before the annual convention of the National Association of Cement Users, Leonard C. Wason, of the Aberthaw Construction Co., pointed out, that experience seems to show that with concrete floors, it takes longer to heat up the structure for the first time, than in the case of wood floors. However, after the building has once become thoroughly warmed up, it requires much less heat to maintain a constant, comfortable temperature than does mill construction, so that the heating account in the long run, appears to be considerably cheaper with concrete. Where the heating expense is of considerable magnitude, this feature might very properly be seriously considered in the choice of building material.

Gossip of the Trade

The city of Montreal has awarded the contract for eight concrete mixers to Foss & Hill, Canadian representatives of the London Concrete Machinery Co. The price was $9,628.

The Coventry Chain Co., Coventry, England, inform us that their "Coventry" chains are fitted to the new government airship, "Delta" for propeller tilting purposes, and to the "Beta" for propeller driving.

P. G. Smith, Sec., the J. D. Smith Foundry Supply Co., Cleveland, Ohio, has taken charge of the firm's Eastern offices, at 378 Ellicott Square Bldg., Buffalo, N.Y., from which point all the Eastern and Canadian trade business will be handled.

Mr. Howard, president the Detroit Foundry Supply Co., is making a trip through Canada in the interests of his firm. They manufacture and deal in foundry supplies and equipment, also polishing and plating supplies. A new catalogue covering the latter will be issued shortly.

W. C. Mitchell, for some time general superintendent of the Dominion Steel Company, has accepted the position of superintendent of the Algoma Steel Company, and leaves shortly for Sault Ste. Marie.

The Foss & Hill Machinery Co., Montreal, have been appointed agents in the Province of Quebec, for the Queen City Machine Tool Co., Cincinnati, Ohio, manufacturers of metal shapers, and also for the Hoefer Mfg. Co., Freeport, Illinois, makers of drill presses.

The Vancouver and Prince Rupert Meat Co., New Westminster, B.C., has purchased and are installing a 30-ton, 2 cylinder, double acting, vertical ammonia compressor, made by the Armstrong Machinery Co., Spokane, Washington, for operation at the new abattoir and packing plant on the Frazer River; the same to be operated under a direct expansion system.

The John Inglis Co., Toronto, have received an order for a direct-acting, horizontal compound duplex steam pump from the town of Chapleau. The steam cylinders are 10½ and 18½ inches dia., the water cylinders 12 inches dia., and the stroke of all is 12 inches. The duty required is 1,000 imperial gallons per minute; the pressure being 70 pounds for domestic service, and 130 pounds for fire service.

Another order lately received from the Owen Sound Electric Light Station calls for a horizontal tandem compound Corliss engine with cylinders 16 and 36 inches dia. by 36 inches stroke, developing 300 i.h.p., at 75 r.p.m.

In addition to the above the firm have secured an order from the city of Gananoque for a horizontal cross-compound pumping engine, to deliver 1½ million imperial gallons per 24 hours against a domestic pressure of 60 pounds and a fire pressure of 115 pounds.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

LUNENBURG, N.S.—A local company has been successfully formed in this town to carry on the manufacture of gasoline engines, mill gear of all kinds and do general repair work. A. E. Ernst formerly supt. of the Truro Foundry Co., is in charge.

CORNWALL, ONT.—Jas. E. Quig & Co., Engineers and Machinists, have opened up a machine shop here and will do all kinds of work in the line of engineering, machinery, boiler making and blacksmithing.

OTTAWA, ONT.—A. E. White, of Wisconsin, a prominent manufacturer of saw swodges and sawmill machinery, contemplates establishing a branch here.

DANVILLE, QUE.—John O'Donnell has opened a garage and repair shop here.

TORONTO, ONT.—The Noon Universal Coupler Co., capitalized at $100,000, have been incorporated.

FORT WILLIAM, ONT.—Sir Wm. White has announced that it would be impossible to build a locomotive repair shop any place east of Alberta, as by the time the shops were completed the company expect to have 800 locomotives waiting to be repaired in them. To haul those locomotives to the head of the lakes would be entirely out of the question. He expressed the opinion that the head of the lakes was, however, a suitable place for car building shops.

WEYBURN, SASK.—Messrs. Acton and Montgomery have acquired the Weyburn Machine Shop from A. Huel.

OTTAWA, ONT.—The International Foundry Co., of London, capitalized at $75,000, have been incorporated.

NEW YORK.—The Canadian Pacific has ordered 3,000 tons of rails, which will be rolled by the Lackawanna Steel Co. for quick shipment to Kingston, Canada. Recent export business also includes a contract for 20,000 tons of structural shapes from bridge builders in Canada.

BELLEVILLE, ONT.—The rolling mills have been closed down of late and extensive improvements are being made. The furnaces are being rebuilt and several new machines are being installed.

TORONTO, ONT.—Work on the new dry dock for Toronto at the Polson ship yards is about to commence. It will be of steel with concrete foundation and in three sections. When coupled together it will be 600 feet long, 100 feet wide and admit a vessel 80 feet wide. The Polson Company expect to have two sections of dock completed this fall. The cost will be $900,000.

INGERSOLL, ONT.—The John Morrow Screw Co., who announced recently that they would expend $150,000 on improvements, have awarded a $20,000 contract for building to Nagle and Mills.

VANCOUVER, B.C.—The Pacific Electric Heating Co., of Ontario, Cal., is establishing a plant here for the manufacture of "Hotpoint" electric irons and various other electric appliances. R. R. McCrea is manager.

WINNIPEG, MAN.—The Canadian Northern closed a $300,000 contract with the Canada Foundry Co. recently for a number of freight and passenger locomotives to be delivered this fall.

BLAINE, B.C.—John Nicoll has purchased the personal property of the Blaine Foundry & Machine Company, and is now in charge of the foundry and machine shop located on E street.

TRENTON, ONT.—The factory of the Barr Registers is being put in shape here by W. H. Matthews and Mr. Barr. The Canada Iron Mines, Ltd., will establish a new concentrating plant here also.

WELLAND, ONT.—A new foundry and moulding department has been added to the plant of Quality Beds, Limited. This addition is of brick construction and is of the very latest design, size 60x80. The addition will practically double the output.

MONTREAL, QUE.—The Dominion Bridge Co. is taking steps to enlarge its holdings south of the Grand Trunk Railway tracks at Lachine. It is said that the property between the works and the Rockfield boundary are to be acquired.

WELLAND, ONT.—The new factory of the Imperial Manufacturing Co. is in course of erection. The firm is entirely new and independent, having no connections in the States. Hardware specialties of all kinds will be manufactured.

ESTEVAN, SASK.—Walstead and McGraw, machinists and automobile experts, of Kenmare, N.D., have acquired the Skinner Electric Light building, and intend running an up-to-date auto garage and machine shop.

OTTAWA, ONT.—Letters patent of incorporation have been issued to the Thomas Davidson Manufacturing Co., Montreal, with a capital stock of $5,000,000. The company is authorized to carry on the business of smelting, casting, etc. The incorporation is through Buchan and Dillon, advocates.

WOODSTOCK, N.B.—Small and Fisher's machine shop was badly damaged by fire recently. The moulding shop was gutted.

GUELPH, ONT.—Guelph has secured another industry, the Canadian branch of the Flexible Conduit Co., of Penn Yan., N.Y., which manufactures electrical conduits.

OTTAWA, ONT.—In connection with the option secured upon extensive property on the Richmond road, it is learned on reliable authority that it is intended mainly for ma-



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are carried in stock at factories and warehouses. The essential features of a good Nut as found in our product are:—

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chine shops and other appurtenances to the Canadian Northern Railway.

REGINA, SASK.—The Cockshutt Plow Co. will erect a $50,000 warehouse in this city.

VANCOUVER, B.C.—The largest mechanical pulp mill in Canada will be situated at Ocean Falls. The Ocean Falls Co., Ltd., head office this city, have secured all the machinery possible from local sources, and are erecting a fully equipped plant that will eventually employ 700 men.

EDMONTON, ALTA.—The Edmonton Ironworks Co. are erecting a foundry and warehouse at a cost of $10,000 each and will engage in the manufacture of plows.

PRESTON, ONT.—The Preston Woodworking Machinery Co. have received a charter and are preparing to erect a factory 100x100 ft. and a moulding shop 40x60 ft.

ST. JOHNS, P.Q.—W. J. Walsh, head of the Holyoke Steam Boiler Works, contemplates establishing a plant here. The Holyoke Steam Boiler Works are by no means a new venture and have already filled large contracts in Canada and in Newfoundland, besides having many big orders ahead.

ST. CATHARINES, ONT.—Machinery has been installed in the Welland Vale factory, to be used in the manufacture of rakes. The rakes will be welded by electricity.

THOROLD, ONT.—The Coniagas Reduction Co. suffered a $15,000 loss by fire recently. The fire nearly wiped out the blast furnace.

BROCKVILLE, ONT.—Local capitalists have formed what will be known as the Atlas Motor Car Co., for the manufacture of automobiles. The company, which is capitalized at $200,000, has started work on the erection of a factory.

MEDICINE HAT, ALTA.—The Alberta Foundry and Machine Shop have commenced operations. Castings of iron and brass will be turned out for general building and corporation work as well as machine parts, pipe connections, etc. The pig iron used is obtained from Port Arthur, the scrap iron locally.

MEDICINE HAT, ALTA.—The installation of the machinery at the Alberta Rolling Mills is nearing completion. The boilers and one engine are installed and the machine shop department is already running, turning the big rollers to the proper size for the mills. The management expect to commence rolling by August 10th.



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You can cut this time to a fraction with our latest model.

Plenty of water, the right kind of wheel, rigidity and no lack of belt power put your grinding on a "delivering the goods" basis.

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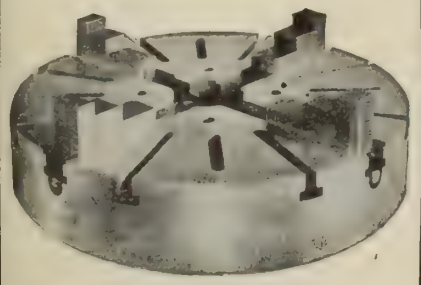
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ALUMINIUM GRANULES
to the ton of steel or iron will increase the tensile strength of your castings without decreasing the ductility—it will produce smooth faced castings and avoid blow holes—therefore will reduce your loss in castings to a minimum.

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MALLEABLE IRON CASTINGS
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BRANTFORD ONTARIO

FORT WILLIAM, ONT.—The Steel Company, of Canada, has taken over the Fort William proposition of the Superior Rolling Mills Company, and are preparing to establish a plant here.

SAULT STE. MARIE, ONT. The $4,000,000 mill of the Lake Superior Pulp and Paper Co., will be located on this side. The new building will be 500 by 180 feet and will take eighteen months to erect. A new cofferdam is being constructed to augment the power now supplied to the pulp mill, and the output of pulp will also be increased by another 500 tons per day to supply the paper plant. A battery of fourteen boilers is also to be installed in the old power house of the sulphite mill. The plant will employ about 300 hands. Bonds to the value of about $3,500,000 were floated in London several weeks ago. The industry, when completed, will represent an investment of $8,000,000.

VANCOUVER, B.C.—Capitalized at $10,000,000, the British Columbia Steel Corporation has announced that immediately at Port Mann construction will be undertaken of the first unit of the great steel plant. Plans have been decided upon for unit No. 1, which will cost $700,000.

TORONTO, ONT.—The Canada Foundry Co. have delivered 1,500 feet of the order of 3,500 feet of new intake pipe given them by the city council at their meeting of May 29. According to the contract between the city and the company, the whole order of 3,500 feet is to be delivered in 90 days, the manufacturers getting a bonus of about $11,000 for getting the work done with extra despatch.

WELLAND, ONT.—Contracts for the erection of four additional buildings to the plant of the Page-Hersey tube works were let last week to David Dick & Sons. The total cost of these buildings will be about $40,000. The new buildings will consist of pumphouse, pattern shop, storehouse building and butt weld mill. Each building will be constructed of brick and steel.

NORTH VANCOUVER, B.C.—The Wallace shipyards were wiped out by fire recently.

ORILLIA, ONT.—The National Hardware Co., which manufactures door locks, etc., is erecting a $16,000 addition. The Canada Refining and Smelting Co. is doubling its capacity.

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Shelby Seamless Steel Tubing

is saving time, reducing costs and improving products. Because it is made in hundreds of sizes and gauges and almost any section---because it can be bent, coiled, flanged, expanded, swaged or upset---because it is remarkably homogeneous and strong---it offers short cuts in hundreds of manufacturing operations.

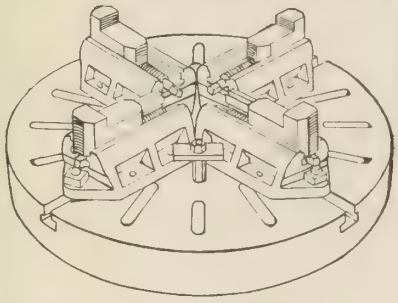
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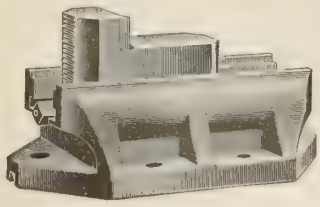
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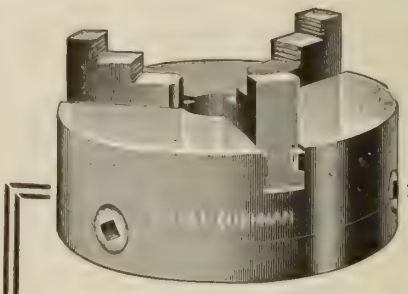
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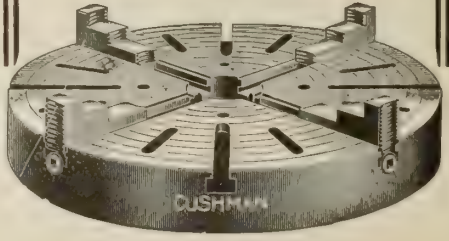
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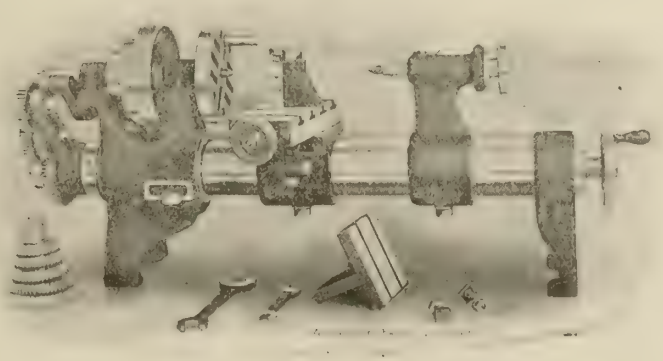
must at times feel the need of an inexpensive lathe for his private experimental work. Much good thought and invention die out for want of easily and cheaply making experiments or models of an idea, a whole workshop of expensive tools usually being required, although the model needed may be small.

WE HAVE DESIGNED A TOOL FOR THIS WORK

A complete, self-acting, sliding, boring and screw-cutting lathe, 4 in. centres, 2 ft. 4 in. bed, capable of doing all plain milling, keyway cutting, etc.

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The JOHN MORROW SCREW, Limited, INGERSOLL

EGANVILLE, ONT.—During the recent fire here the machine shop and harness shop of M. J. McCann were destroyed. Loss $6,000.

HAMILTON, ONT.—The Marsh Standard Cable Co., Pittsburg, has decided upon Hamilton, Ont., as the point at which to establish its Canadian plant, to cost $500,000. A site has been chosen. Other United States companies that have arranged to establish branch works in Hamilton are the Boston Insulated Wire & Cable Co., Dorchester, Mass.; Taylor Mfg. Co., Princeton, Ind., makers of store fittings, etc., and Mayor Brown Co., manufacturers of brass and stencil goods.

TORONTO, ONT.—James H. Havill, architect, Toronto, has prepared plans covering a fireproof factory building for the C. A. Dunham Co. on the corner of Primrose Avenue and Davenport Road, Toronto, and tenders have been called for it. The C. A. Dunham Co., Ltd., are the manufacturers of the Dunham vacuum steam heating system used in many of the principal buildings in Canada. The head office of the company is 511 to 513 Continental Life Building, Toronto, with branch offices in Winnipeg, Vancouver and Montreal.

MUNICIPAL.

CALGARY, ALTA.—The by-law endorsing an expenditure of $20,000 for sewer purposes, was carried.

WINDSOR, ONT.—The waterworks by-law for $50,000 was carried.

WILKIE, SASK. The by-law to raise $25,000 for waterworks was carried.

NANAIMO, B.C.—The burgesses passed the $50,000 sewerage extension by-law.

TORONTO, ONT.—Final assent was given by council to the issue of $745,173 general consolidated loan debentures for repairs to the waterworks intake pipe and for a new intake and six foot steel conduit and additional water mains for the water system of the city.

SASKATOON, SASK.—Big municipal improvements are planned for Saskatoon. The plans are for a $25,000 waterworks system and other improvements.

CORNWALL, ONT.—The ratepayers passed a by-law to raise $30,000 to lay an additional water main from the pump house to the centre of the town and thence east, north and south by 12-inch mains.

WINGHAM, ONT.—The voters carried the $5,000 by-law for the completion of a pure water system.

RAYMOND, ALTA.—The town council passed a by-law authorizing the raising of a loan of $10,000 for waterworks.

DRESDEN, ONT.—The council have instructed E. W. Farncomb, C.E., to prepare the necessary plans and specifications for the proposed waterworks and to proceed with the installation of the system as soon as possible.

ST. LAMBERT, QUE. The town authorities will take up the study of plans for the purpose of establishing a plant equipped to prepare all its sewage flowing into the river as early as possible. Engineer Dickinson has already studied the question and has presented plans for a thoroughly up-to-date sedimentation plant with filtration beds.

CARLSTON, ALTA. The ratepayers have voted $40,000 for a gravity water system.

ELECTRICAL.

EGANVILLE, ONT.—The electric light plant, sawmill and block owned by J. D. McRae was destroyed in the big fire here recently. Loss $10,000; insurance $2,500.

KAMLOOPS, B.C. Kamloops is getting ready to expend $200,000 in developing 5000 horsepower on the Barrier River, a tributary of the North Thompson River. The power will be conveyed forty miles to Kamloops, where it will be utilized in pumping water for the reservoir and waterworks system as well as for industrial purposes.

NAPANEE, ONT.—The by-law authorizing the town to sell the municipal electric plant to the Seymour Power Co. was carried. The town sells the plant to the Seymour Co. for about $40,000, and gives the company a thirty-year contract, and secures electric light at eight cents net a kilowatt hour for consumers.

ORILLIA, ONT.—A by-law to raise $80,000 for enlarging the town's power and light plant was carried.

INGERSOLL, ONT.—The council passed a by-law for the raising of debentures amounting to $25,000 for extensions and alterations to the electric light plant.

TORONTO, ONT.—The General Hospital Board have decided to instal a private plant for generating electric power of the capacity of 400 kilowatts.

HAMILTON, ONT.—The by-law providing $305,100 for a municipal power plant was carried.

WILKIE, SASK.—The ratepayers passed a by-law authorizing an expenditure of $10,000 for an electric light system.

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Special styles of all kinds to order.
THE CLEVELAND WIRE SPRING CO.
Cleveland, Ohio.

NEW BOILER SHOP.

The Polson Ironworks Co. will build, adjoining the new dry dock to be constructed by them at the foot of Frederick street, Toronto, a boiler shop, composed entirely of steel, excepting one wall of brick. The dimensions will be 300x120 feet. Two flange compartments will be erected; one 60x40, will be used as a pump and compressor room, the other, measuring 60x60, to be used as a flange fire shop, the construction being such that fumes, etc., will not reach the main boiler-making section. The roof of the boiler shop will be fireproof asbestos.

PARTNERSHIP DISSOLVED.

The partnership of the well-known firm of engineers, Ross & Holgate, has been dissolved. Henceforth the business will be continued under the name of R. A. Ross & Company.

Henry Holgate, who has been associated with Robert A. Ross for the past ten years, has joined the Cedar Rapids Power Company, and will take over the control of that concern as president. Ross & Holgate, during their partnership, were concerned with the establishment of some of the best known electrical works in the country, notably the Hydro-Electric and the West Kootenay Companies. They were also consulting engineers for the Canadian Pacific Railway, and it was under their supervision that the Angus shops were laid out. Mr. Holgate was chairman of the commission which was appointed to investigate the cause of the collapse of the Quebec bridge.

DRUMMOND BROS., LATHES.

Drummond Bros., Ltd., Ryde's Hill, Guildford, Surrey, Eng., are introducing their various lines of manufacture on the Canadian market, and as steps are being taken to secure suitable representation throughout the Dominion, a brief account of the different specialities offered is as follows:

The New Model-Maker's "Precision" Lathe is designed to meet the wants of model makers, who require a tool capable of very varied and accurate work, combined with a sufficiently low price to enable satisfactory pursuit of this fascinating and useful hobby.

The 3½-inch Centre Back-Geared, Self-acting, Sliding, Boring and Screw Cutting Lathe has been designed specially for Model Engineering and Precision Work, inventor's model work or light running repairs to motors and has in this respect many attractive and useful features.

The new design "Workman's" lathe meets the wants of motor and cycle repairers, general machinists, etc., and provides a reliable tool at moderate cost to those of limited capital.

The 9 and 7½-inch SSS lathe is designed for the use of high-speed tool steels, up to the full capacity of modern steel production.

The 5-inch SSS lathe for treadle or power is adapted for repairs to motors and motor cars, and is claimed to be the only lathe of its size, built with the special idea of overtaking this class of work.

In a future issue, fuller illustrated detail descriptions will be given of these machines.

ANOTHER BIG MERGER.

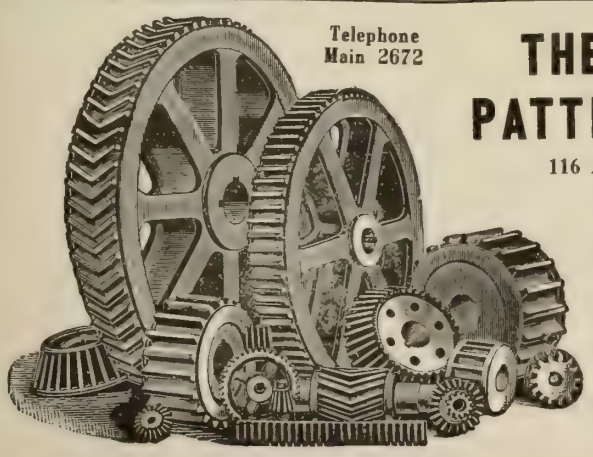
A merger has been effected of several well-known industries of Canada. Those interested are the Perrin Plow & Stove Co., of Smith's Falls; the Tudhope-Knox Co., of Orillia, makers of steel truck; the Tudhope-Anderson Co., of Winnipeg, and the West Lorne Wagon Co.

The new concern will be known as Tudhope Co., Limited, and it will be capitalized in the millions. The headquarters will be at Orillia, and F. J. Oliver, who is the chief shareholder

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Only the highest grade of material used in our work. We can handle your pattern work to your complete satisfaction.
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Send this advertisement with your name and occupation for particulars of full courses. Address
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GREY IRON CASTINGS.
All weights up to 6,000 lbs.
We make a specialty of difficult cored work
LET US FIGURE ON YOUR REQUIREMENTS
GALT FOUNDRY CO, GALT, ONT.

of the Perrin Plow & Stove Co., will be manager. A large addition will be made to the Tudhope-Knox Co. plant at Orillia, and work has already been begun on it. The plow plant of the Perrin Co. will be transferred from Smith's Falls to Orillia, but the stove plant will remain there and will be greatly enlarged.

PLOW CONCERNS UNITE.

The announcement has been made that the Cockshutt Plow Co., of Brantford, and the Frost & Wood Co., of Smith's Falls, have united their sales departments by a mutual understanding. Under this arrangement, the Cockshutt Co. will take charge of all territory west of Peterboro, acting as sole agents for the Frost & Wood Co., and the reverse will be true east of Peterboro in Ontario, Quebec and the Maritime Provinces. It is claimed this will build up a stronger sales department at a minimum of expense, and that it will secure the best local agents for the two companies. In addition to the manufacturing plants at Brantford and Smith's Falls, which are about to be considerably enlarged, these companies have large distributing offices at Ottawa, Montreal, Quebec, St. John, Truro, Charlottetown, London, Winnipeg, Brandon, Regina, Saskatoon, Edmonton, Calgary, New Westminster and Victoria.

CANADIAN TUNGSTEN LAMP CO.

The annual meeting of the Canadian Tungsten Lamp Co., Ltd., was held at the head office of the company, Hamilton, on Wednesday, July 5th. All the shareholders, with two exceptions, being present.

Mr. Ginder, the president and general manager, presented his annual statement, showing a business increase of nearly 40 per cent. over the previous year, and, notwithstanding the immense amount of money spent in research work in their laboratory, the balance to the credit of the profit and loss account was deemed most satisfactory. The usual dividend was declared. The directors retiring were unanimously re-elected, viz., W. H. Ginder, president and general manager; F. W. Gates, vice-president; P. D. Crerar, K.C., honorary treasurer; Geo. Webb, A. Ward and G. H. Levy, board of directors.

An executive committee of three was elected, before whom all vital questions will be brought and decided upon, this committee reporting full particulars to the board of directors at their monthly meeting.

The company own a large piece of ground in the rear of their factory, and the question of building a five-storey extension was fully discussed. The president was instructed to get plans and specifications so that arrangements could be made to commence immediately this most necessary addition.

CONTRACTS OPEN.

WILKIE, SASK.—Sealed tenders will be received by T. A. Dinsley, secy.-treas. of the Town of Wilkie, until noon, Monday, August 21st, 1911, for supply and delivery of the following machinery, materials, etc.:

Tender A: electrical machinery—

(1) One 60 k.w. 3-phase, 60-cycle, 2,200 volt a.c. generator.
(2) One exciter for above.
(3) One marble switchboard, instruments and switches.
(4) Three 2,200 volt motors, back-geared to pumps.
(5) Five Transformers for lighting system.
(6) Series Tungsten Street lighting system.
(7) Approximately 25 cwt. of weatherproof copper wire (line material, guy wire, arms, pins, insulators, etc.).
(8) Cedar poles.

Tender B: one 100 I. H.P. International Combination Engine.

Tender C: Pumping Machinery—

(1) One working head and deep well cylinder.
(2) One half-million gallon pump.
(3) One air compressor.
(4) Necessary shaftings and belting.

Tender D: one Pneumatic Storage Tank.

Tender E: approximately 1,100 ft. 8-in. cast-iron water pipe.

Approximately 4,800 ft. 6-in. cast-iron water pipe.

Approximately 2,000 ft. 4-in. cast-iron water pipe. 15 hydrants and 22 valves.

Tender F: Trenching, laying cast-iron water pipes, hydrants, valves, etc., and back filling.

Plans and specifications may be seen at the office of the Secretary-Treasurer of the Town of Wilkie, or on application to the Engineers, McArthur & Murphy, Room 8, Bottomly Block, Saskatoon, Sask.

LONDON, ONT.—Tenders are asked for about 3,300 feet of 18-inch, and 1,600 feet of 12-inch cast-iron pipe, with a number of valves and specials. Tenders received not later than noon August 12th, 1911. For specifications and forms of tender, write H. J. Glanbitz, General Superintendent, Waterworks and Electrical Depts., London, Ont.

VIRDEN, MAN.—Tenders will be received until August 18th, 1911, for the installation of a steam heating plant in the Virden Municipal Hall. Plans of building may be seen and other particulars obtained at the office of J. F. C. Menlove, Town Clerk, Virden.

CATALOGUES.

The Armstrong Bros.' Tool Co., Chicago, have sent us Booklet No. 4, descriptive of their Ratchet Drills. Four different types: the Packer, Standard, Universal and Short, each covering a particular service requirement, are offered by the firm to meet any kind or condition of work.

Simonds Canada Saw Co., Montreal, Quebec, St. John and Vancouver, have forwarded us several of their "Cigar Fan Novelties," their "Guide for Millmen" and "Wall Poster Leaflets." The cigar fan, when extended, gives a faithful representative of a saw, and suggests the continued ingenuity of the firm in bringing their manufactures prominently before users. The Guide to Millmen, in addition to useful information on saw questions, contains much good advice concerning health and habits. The Wall Poster is devoted to the Simonds "Hack Saw Blades," and should have a prominent place allotted to it where such commodities are in operation.

The Norton Co., Worcester, Mass., have recently issued a book, entitled "Safety as Applied to Grinding Wheels." Illustrated descriptions are given of modern safety devices which can be practically applied to the use of grinding wheels and machines, and in view of the wide attention being directed to this subject, those interested are invited to procure a copy from the Norton Co., Publicity Dept.

The Armstrong Bros. Tool Co., Chicago, have issued their booklet No. 5, containing an ingenious assortment of lathe dogs and clamps. Some of the devices are especially adapted for use on finished work, and can be quickly applied without removing work from centres. A bolt driver of special merit, suitable for square, flat or hexagon, is described and illustrated, and as a time-saver is sure to meet with approval. There are ten illustrations in the booklet and all are of interest to machine shop men. Copies of the publication may be had on application to the Company.

The Mesta Machine Co., Pittsburg, has issued a catalogue devoted to steam-hydraulic forging and bending presses of the Hamel & Lueg type. In these presses, the steam and hydraulic cylinders are direct-connected, thus making it unnecessary to force the water in the press cylinder through pipes, while the machine is in motion. With this self-contained feature, the presses may be economically installed and operated. The catalogue contains several good illustrations of these presses. The Mesta Machine Co. has obtained the exclusive manufacturing rights in the United States and Canada.

The Springfield Machine Tool Co, Springfield, Ohio., have issued a thoroughly well-illustrated Catalogue G., descriptive of the various high-grade lathes and shapers manufactured by them. Each type of machine has its various details clearly shown, enabling those in search of a trustworthy tool, to see at a glance the features set forth. Two types of engine lathe are made, and on each type, five different styles of head may be supplied if necessary. One type represents complete mechanism and design for rapid change of feed and screw cutting, while the other is equipped with a rapid gear feed drive only. The latter permits of a more economical tool in the matter of first cost to the user, and is adapted more as a manufacturing lathe than for tool use. Four different sizes of motor-driven engine lathes are described, as are also the Fox Monitor Turret and Shafting lathes. Crank and back-geared shapers, motor-driven and otherwise, complete with illustrations of bench-straightening presses with centres, and pneumatic presses, the 64 pages of this attractive publication.

BIG FIRMS UNITE.

An amalgamation has taken place between the Canadian Fairbanks Co., Ltd., with head offices in Montreal and numerous branches throughout Canada, and the Fairbanks-Morse Canadian Manufacturing Co., Ltd., with head offices in Toronto, and its subsidiary companies, the Dominion Safe & Vault Co., of Farnham, Que., and the E. & T. Fairbanks Co., of Sherbrooke.

The president of the new concern will be H. S. Fuller, of Montreal, president of the Canadian Fairbanks Co., and the vice-president, P. C. Brooks, of Toronto, president of the Fairbanks-Morse concern.

The capitalization of the new company is to be $2,600,000.

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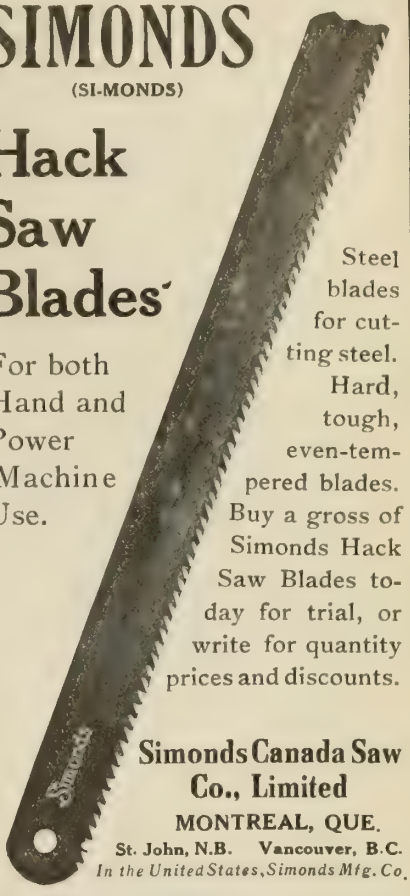
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The simple reason for the lasting qualities of

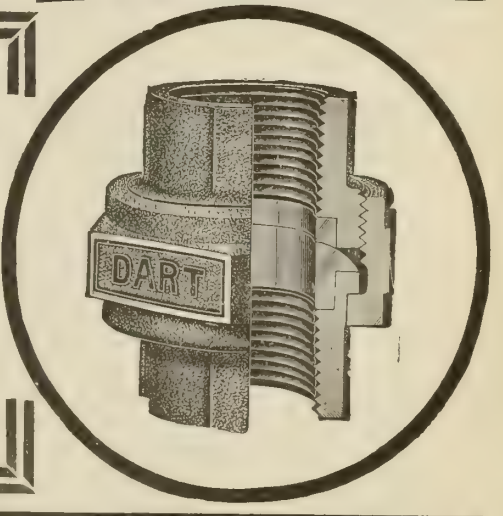
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For Rapid Production of Sheet Metal Stampings

W. H. BANFIELD & SONS

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WOODSTOCK CO. TO BE WOUND UP.

The Maxmillian Machine Co., which started here some months ago to manufacture pneumatic hammers, has decided to wind up. No single-handed hammer has been successfully made and sold, and trouble has been experienced between the directors and the patentees all the time. It is said that the hammer shown to the Industrial Committee at work, was not the hammer for which the promoters had the patent, so the Woodstock people were stung. The city gave the company $1,250 to start, and this would seem to be lost, unless the settlement is more satisfactory than expected.

OTTAWA—The G.T.R. will erect new coal chutes at Ottawa. They will be of steel, with a bunker capacity of 350 tons, and will do away with the present trestle work, the whole plant being concentrated in a much smaller area. The coal will be dumped from the cars to a pit below the track from which it will be hoisted by electric power to the bunkers which are covered in. It will be a very up-to-date coaling plant, causing no dust and occupying little space. Its site will be just east of the company's carshops and its cost is expected to be about $15,000.

OSHAWA—Oshawa is within a month and a half from Trent water electric power. The transmission line poles are already strung from the Trent river power house at Trenton, 65 miles away from Oshawa, excepting short breaks between Cobourg and Port Hope and between Newtonville and Newcastle. The wires, themselves, will be strung the entire distance to Oshawa on or before Aug. 1, as a second construction gang has recently been put on this work.

NORTH BAY—North Bay will spend $100,000 for new waterworks machinery.

HENSALL—Hensall will install a new waterworks pumping plant.

BOOK REVIEWS.

"Magnetic Properties of Heusler Alloys," by Edward B. Stephenson, has just been issued as Bulletin No. 47 of the Engineering Experiment Station of the University of Illinois. This bulletin is a contribution of data on the subject of magnetic alloys, and describes fully the methods of magnetic testing, thermal analysis and photo-micrography used in the work. The results show that an alloy of ferro-magnetic properties comparable with those of cast iron can be made of the non-magnetic components copper, manganese and aluminum, and that the magnetic properties depend largely on the heat treatment.

Copies of this bulletin may be obtained gratis upon application to W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Illinois.

The use of a block of wood on the top of molten brass in a crucible, when pouring is taking place, serves to protect the metal from oxidation and partially prevents the ingress of dross into the mold. The block burns and gives a reducing atmosphere. This practice has been found to give excellent results and is used in some of the brass rolling mills. The block, which should be of wood, which will not snap when burning, is thrown on the surface of the metal after skimming and just before pouring.

Cutting Crucible Costs

Cost and price are distinct terms.

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are less costly because of the service you get out of them. They give more heats and more general satisfaction than you usually get from crucibles.

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The cheapest and most economical barking device on the market to-day.

WASTE: 16 to 18% according to size of wood.
POWER: 6 to 8 horse-power.
CAPACITY: Up to three cords per hour.

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BAKELITE is the only material yet invented that can be used universally for cold water, wet or dry steam, superheated steam or chemicals.

It has wonderful strength and hardness, and if worn by friction can be reground and refaced.

A percentage of graphite used in their composition gives a lubricating surface, saving the valve seat.

Try BAKELITE Discs under the most severe conditions in your plant, and even with the claims made here for them you will be surprised at the results. BAKELITE can be injured by nothing except careless handling and friction wear.

It is no longer necessary, therefore, to use high-priced special metal discs—BAKELITE Discs keep valves tight no matter how great the pressure or how high the temperature.

Ask your dealer for Bakelite Discs, or write us.

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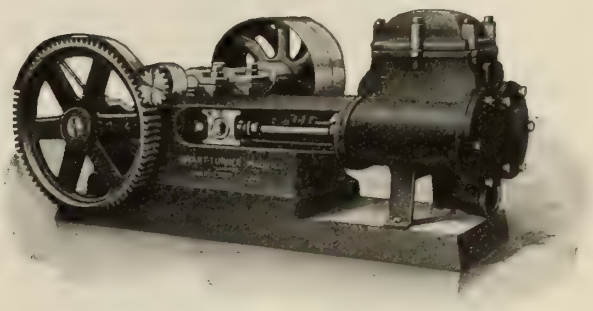
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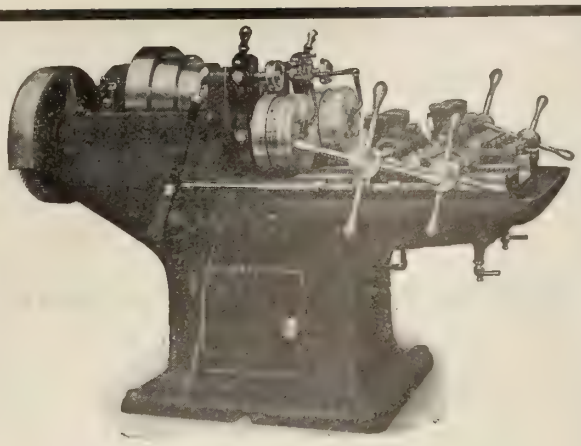
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fully meet the demand for accurate and durable machines, unsurpassed in quality and containing the latest and best features for convenient operation, and large and accurate output. The perfecting of these machines did not happen at once; it took time and careful experimental preparation. Each of the new features embodied in these Screwing Machines has been under severe service and rigid test for a considerable period.

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Business Doubled in One Year

thereby proving efficiency and general satisfaction of our product. Over 60% of this business received from firms who have been using our bearings from One to Seven Years.

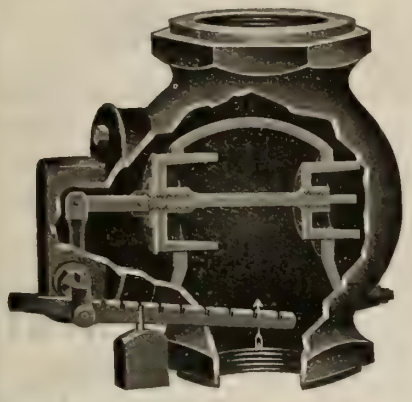
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Double Seated Noiseless Back Pressure Valve



The construction of the inner Valve and seats is of such a nature that uneven expansion of the metals will not cause the Valve to STICK or BIND—A FEATURE which places this Valve in a class by itself. ANOTHER FEATURE of our Back Pressure Valve is that it can be placed in ANY POSITION.

It is a DISTINCT improvement on the OLD STYLE single seated Valve. It has a DOUBLE PISTON TYPE of inner Valves, with disc of different area.

Guaranteed close regulation without excessive weighting. Carried in stock from 2 to 16 inches.

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NEW PROCESS NOISELESS GEARS and PINIONS APPEAL to two classes of manufacturers



1. Those whose product embodies faulty gear drives but should not.

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"Oneida Economy"



Oneida Steel Pulleys are a quarter to a third the weight of cast iron and therefore save from two-thirds to three-quarters of the power required to revolve a cast iron pulley.

The oval crown face fits the belt perfectly, offering 20% better belt adhesion than any other pulley on the market.

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Motors and Generators —for— all purposes



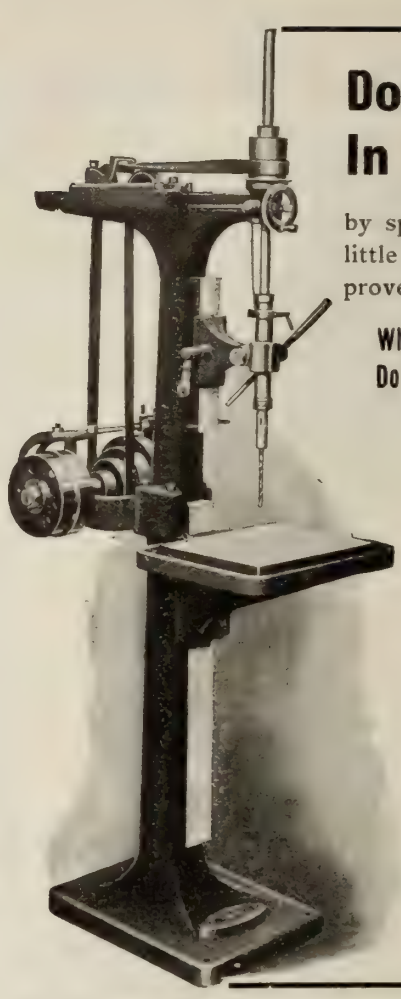
Often Imitated! Never Equalled!

Tallman's Reputation is in the Goods.

MANUFACTURERS OF

Finished Brass Goods
Brass Castings
Aluminum Castings

Tallman Brass & Metal Co.
HAMILTON, ONT.



Dollars Saved In Labor

by spending comparatively little for a modern TOOL proves a good investment

Why Hire Three Men To Do One Man's Work?

THE AVEY
Ball Bearing Drilling Machines

will make you new records of low costs.

Let us show you why and how.

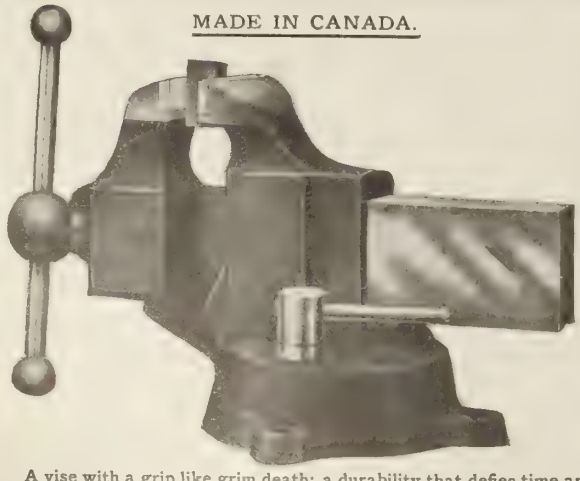
Built in single and multiple spindles for No. 1, No. 2 and No. 3 Taper Drills—various overhangs.

THE
Cincinnati Pulley Machinery Co.
CINCINNATI

The YOST

Solid Jaw and Swivel Bottom Machinist's Vise

MADE IN CANADA.



A vise with a grip like grim death; a durability that defies time and the hardest usage.

A vise that will give you a lifetime of perfect service and satisfaction. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

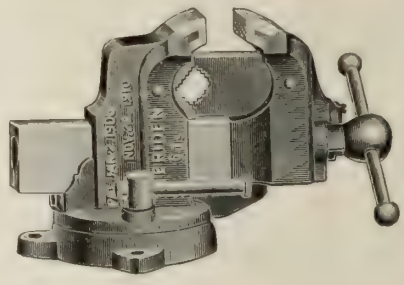
Incomparably Good

The National catalog would certainly interest you. Write us, asking for a copy.

National Machinery & Supply Co., Ltd.
HAMILTON - - ONTARIO

This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.

PARKER'S
Combination Pipe Vises



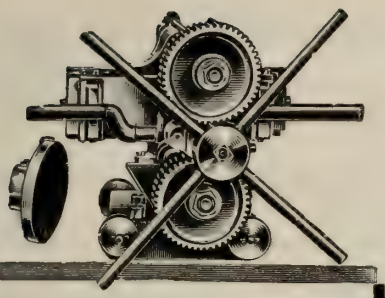
are efficient, convenient, simple and quick-selling.

They are very strong, being fitted with Solid Steel Bar Straightness, and having removable Jaw Faces made of the Best Tool Steel.

All the parts are interchangeable, and the whole vise is a compact and very serviceable tool.

The Charles Parker Co.
Meriden, Conn., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.



PATENT
Shaft Straightening MACHINE

For use on the Lathe.
NO HAMMERING

For round or square Bars, Cranks, Tubes, Etc.

Write for Lists to

W. COPLEY & SON
Machine Tool Makers
HALIFAX - ENGLAND



National Cutters

Will increase the efficiency of your men and your machine.

Will give the longest and most satisfactory service.

They are made from the highest stock by the most approved methods and are fully guaranteed. A trial will convince.

WRITE FOR CATALOG B.

THE NATIONAL TOOL CO.

Cleveland
Sixth City



The Point of Real Economy

"AMPHIBIA"
LEATHER BELTING

is an absolutely guaranteed belting that is the direct result of 30 years of diligent development in methods and materials. **"Amphibia"** is designed especially for use in wet places. No matter how damp the place **"Amphibia"** will give a longer and more satisfactory service than any belting yet produced.

Different Grades for Different Purposes

as follows:

"AMPHIBIA" WATERPROOF BELTING could be used under water without harming it in any way.

"AMPHIBIA" Heavy Single is made for extra heavy work, from very thick leather.

"AMPHIBIA" Light Double will take moderate power over small pulleys.

"AMPHIBIA" Heavy Double is the giant belt intended for heavy mill work.

"AMPHIBIA" Planer for the particular work on wood planers.

"AMPHIBIA" Special Laundry for the wash wheels.

WRITE AT ONCE

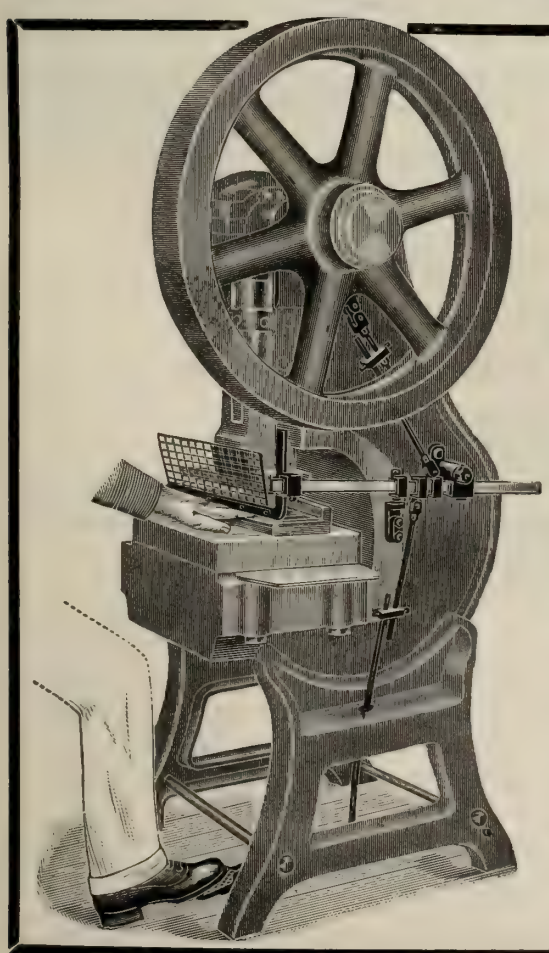
We have the largest and best equipped belt factory in Canada—you will save money by writing us.

Catalogue on request

SADLER & HAWORTH

ESTABLISHED 1876

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Toronto, 27 Melinda St.
St. John, N.B , 89 Prince William St.
Winnipeg, 244 Princess St.
Vancouver, B.C., 217 Columbia Ave.



SAFETY

For Employees
Against loss of hands.

For Employers
Against loss by damage suits.

The **JONES GUARDS** give this, and without interfering with output of work.

Guards for Presses, Saws, Jointers, Shapers, etc.

Particulars and prices on application

The Jones Safety Device Company, Limited

22 King William Street
HAMILTON ONT.

Branches in United States:
Buffalo, N.Y. New York, N.Y
Chicago, Ill.



THE SOURCE OF REAL SERVICE

in tools springs from the use of a grinder which keeps them always in perfect condition. A very economical and efficient one is

BLOUNT'S

WET TOOL GRINDER

which can be run continuously if desired. It is fitted with self-oiling bearings, and there is no wear of parts, because the propeller of the pump, furnishing a constant supply of water, is loosely fitted, and does not touch the case at the nearest point. A sleeve cap prevents leakage without the use of packing.

WRITE US FOR FULL PARTICULARS

J. G. Blount Company
EVERETT, MASS., U.S.A.

BLISS "Stiles" Presses BLISS

with adjustable tables



built in various sizes, are specially useful for heavy bending, forming, punching and stamping operations in the manufacture of hardware, cutlery, electrical parts, automobile parts, etc. The design of the frame combines greatest strength and rigidity, all adjustments are rapid, convenient and accurate. The adjustable table allows of using dies varying considerably in height; when the table is removed horning tools may be operated. Write for details, stating requirements.

"Presses for Every Requirement."

E. W. BLISS COMPANY

20 Adams St. - BROOKLYN, N.Y., U.S.A.



High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

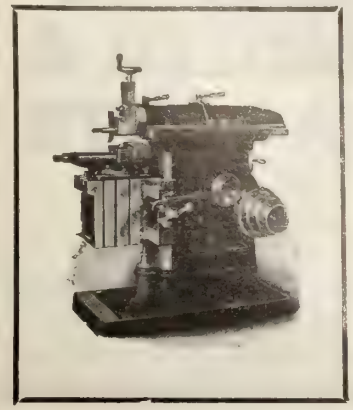
Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.

2305 Farmers Bank Building, PITTSBURG, PA.

EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO
Manufactured under Davy Bros., Ltd., Patents.



SHAPERS

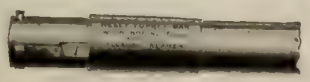
We would like to have your enquiry when you are in the market, as we believe that we can show you better value for your money than any other Shaper manufacturer in the United States. Every machine, before it leaves our shop, is run under belt for at least a week, and it is therefore sure to be in good working order, and will give satisfaction. We would like to send our catalogue describing the superiority of STEPTOE SHAPERS.

The John Steptoe Shaper Co.

1953 Jessamine Street - - - - CINCINNATI, OHIO
Agents: GENERAL SUPPLY CO. OF CANADA, Limited, Ottawa, Toronto and Winnipeg

The advertiser would like to know where you saw his advertisement—tell him.

Type B.—Turret 1" to 5¼"

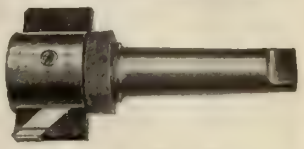


CHAS. NEAT & CO., Agts.
112 Queen Victoria St.
London, - England

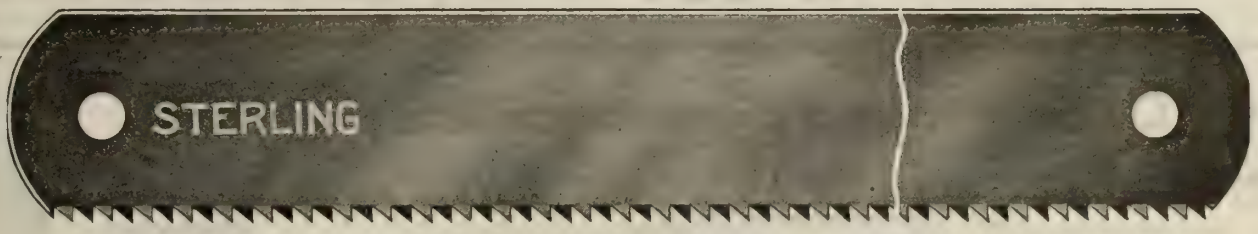
KELLY REAMERS and BORING TOOLS

The kind you will use, exclusively — — THE REASON
—HIGH SPEED—
ADJUSTABLE—REPLACEABLE—BLADES
We solve the "HOLE" problem—ask us.
THE KELLY REAMER CO., Cleveland, U.S.A.

Type C.—Cylinder, 3" to 12"



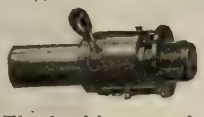
HACK "STERLING" SAWS



A TRIAL WILL CONVINCE YOU OF THE SUPERIORITY OF "STERLING" BLADES

MANUFACTURED BY

DIAMOND SAW & STAMPING WORKS, Buffalo, N.Y.



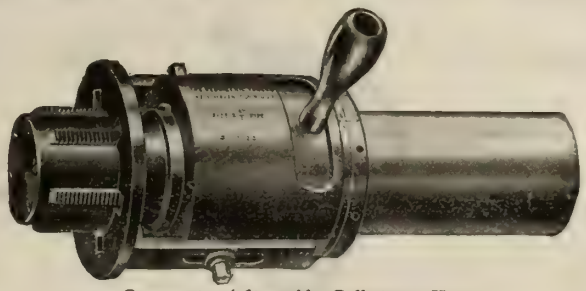
Don't Back Out!



The backing out of your solid taps wastes time, injures the cutting edges of the tap, and often strips or destroys the thread.



Our Collapsing Taps have overcome these difficulties



Geometric Adjustable Collapsing Tap

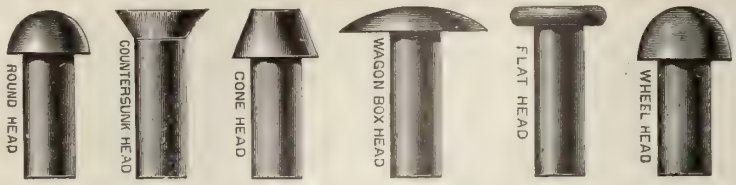
These Taps are furnished for numerous lines of work where threads of 1 inch or larger diameters have to be tapped, either straight or of standard pipe size, and can be fitted for use on the turrets of Screw Machines, Brass Finishing Lathes and other Turret Head Machines, as well as for rotating on Live Spindles, if desired.



We have a Booklet describing our Collapsing Taps of both Standard and Special Types, and should be glad to send you one upon request.

THE GEOMETRIC TOOL COMPANY - New Haven, Conn.

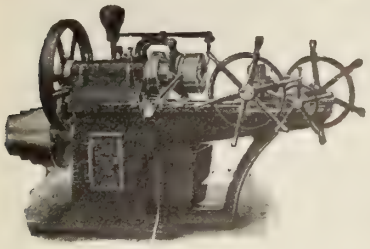
Canadian Agents:—Williams & Wilson, Montreal, Que. A. R. Williams Machinery Co., Toronto, Ont.



We manufacture Rivets of every description, ½ inch dia. and smaller.

PARMENTER & BULLOCH CO., LTD.

GANANOQUE, ONT.



MODERN

Bolt, Nut and Forging Machinery and National Wire Nail Machines

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

BOLT THREADERS, "WEDGE GRIP," BOLT and RIVET HEADERS, FORGING MACHINES, NUT MACHINES, ROLL THREAD MACHINES, Etc., Etc.

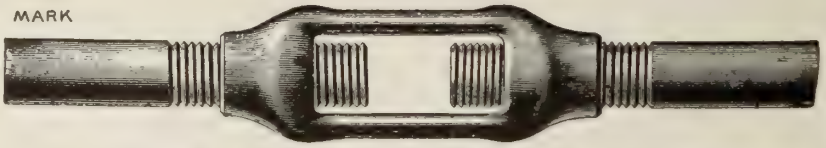
Complete Catalogue "E" upon request.

The National Machinery Co., Tiffin, O., U.S.A.

Canadian Agents: H W PETRIE, Toronto Ont. WILLIAMS & WILSON, Montreal, Que.

Drop Forged Turnbuckles

TRADE MARK



ALL KINDS OF SPECIAL DROP FORGINGS

Send Models of Blue Prints for Estimates.

Machine Wrenches
Screw Drivers
Pliers
Structural Wrenches
Track "
Eye Bolts
Lathe Dogs
Etc.



Canadian Billings & Spencer, Limited **Welland, Ont.**

ARMSTRONG

DROP FORGED STEEL LATHE DOGS



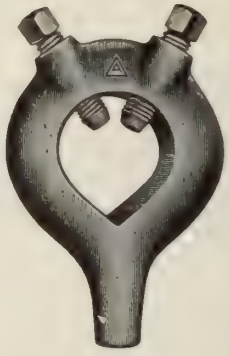
All Kinds
All Sizes
3-8 in. to 8 in.

POINTS OF EXCELLENCE

Uniformity of design.

Tool steel set screws with our improved beveled point which prevents upsetting.

No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.



HEAVY DUTY DOG

Write for Special Circular and Discounts.

Have Armstrong Quality

Best Obtainable in Design, Workmanship and Material

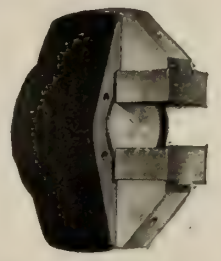
If you Want the BEST Specify ARMSTRONG Drop Forged Dogs



Armstrong Bros. Tool Co., "The Tool Holder People" 106 N. FRANCISCO AVE., CHICAGO, U. S. A.

TRY THE
Garvin Automatic Wrenchless Chucks

and be convinced of their big labor saving features. Simple to operate and no complicated parts to get out of order



For further information { Ask your dealer or write us direct

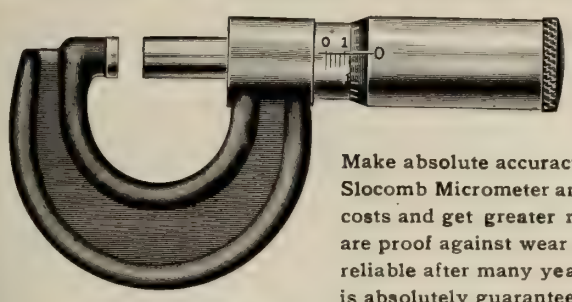
Full description in E Catalog
Visitors welcome

THE GARVIN MACHINE COMPANY
Spring and Varick Streets, New York City

MACHINE TOOL
AND
DIE MAKERS

Russell Machine Co. St. Catharines, Ont.

First-class Workmanship
Prices Right
Estimates Furnished to the Trade



"Slocomb" MICROMETER CALIPERS

Prevent Inaccuracy! Get Greater Profits!

Make absolute accuracy your greatest aim. Use the Slocomb Micrometer and you will begin at once to cut costs and get greater results. Slocomb Micrometers are proof against wear and variation, having remained reliable after many years of hard service. Every one is absolutely guaranteed yet attractive in price.



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J. T. SLOCOMB CO., PROVIDENCE, R.I., U.S.A.

BE PROUD OF YOUR WORK

When it's finished, it must fit, if you've proved your measurements with Starrett Tools. Starrett Tools are made accurate—they last a lifetime and are still accurate.
When you buy them, you buy a faith in yourself and the accuracy of your work which lets you do more work and better work.

Calipers and Dividers
Clamps, Drill Blocks, Levels
Gages, Wire, Thickness, Screw, Pitch—all sorts
Hack Saws and Frames
Jack Screws, Micrometers, Pliers
All sorts of Rules and Steel Tapes
Speed Indicators, Squares

Look through your kit Don't you need some tool to make your work better? Send for Catalog 193—274 pages, full of illustrations and useful information. Send to-day—we will tell you your nearest dealer.

THE L. S. STARRETT CO.

ATHOL, MASS., U.S.A.

NEW YORK
150 Chambers Street

CHICAGO
17 No. Jefferson St.

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H. ETCHES
Mechanical Engineer and Draughtsman
Special Machinery Designed. Working Drawings Made from Patent Office Drawings. Temporary Work Undertaken for Engineers and Machinists. Revising and Re-constructing Old Machinery.
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A ONE-INCH SPACE
$20.00
A YEAR

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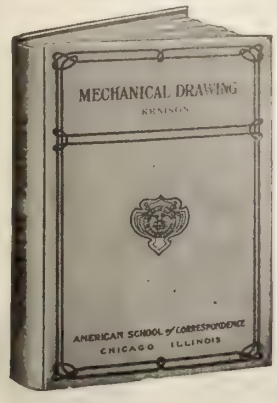
OPAL GLASS TILING
FOR WALLS OF
MACHINERY AND POWER HOUSES
Most approved material.
TORONTO PLATE GLASS IMPORTING CO'Y
PLATE AND WINDOW GLASS
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By Ervin Kenison, S.B.
Instructor in Mechanical Drawing, Massachusetts Institute of Technology
176 pp., 140 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates.
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Half-tone Cuts and Zinc Etchings
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We are producing the very highest quality of machinery cuts from retouched photos and wash drawings.
We want your next order.
Write Us, Phone Us or Call
352 ADELAIDE ST. WEST, TORONTO.

The advertiser would like to know where you saw his advertisement—tell him.

PERFORATED METALS

Describe your need.
"We can furnish."
Inquiries solicited.

We make any size perforation in any kind of metal required.

Canada Wire Goods Manufacturing Co. - Hamilton

We also manufacture

- Wire Cloth for all purposes
- Concrete Reinforcement
- Molders' Riddles and Bellows
- Metal Clothes Lockers
- Steel Factory Stools
- Window Guards
- Ornamental Wire and Iron Work

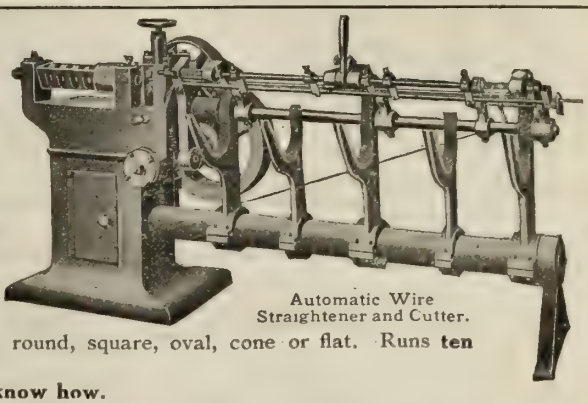


Elastic Rotary Blow Riveter

BUILT TO WEAR

Our Automatic Wire Straighteners and Cutters, every pound of weight **distributed** so as to secure the **greatest efficiency** and **longest wear.**

Makes the wire **perfectly straight,** and **cuts accurate lengths,** rough stock or gold plated, ¾" diameter and smaller.



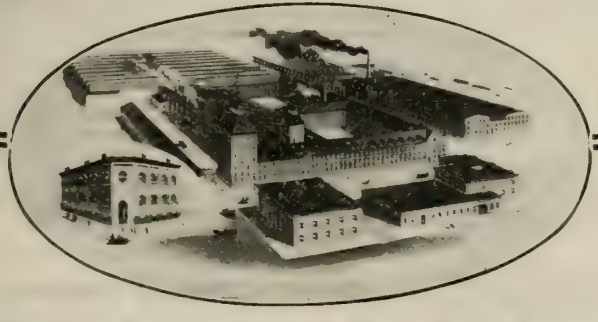
Automatic Wire Straightener and Cutter.

Our ELASTIC ROTARY BLOW RIVETING MACHINE forms a head as **quick as a flash**, every head nicely finished, round, square, oval, cone or flat. Runs **ten hours a day,** every day in the year.

Half a century building this Machinery proves that **we know how.**

THE F. B. SHUSTER CO., *Established 1866* ***New Haven, Conn.***

Straighteners and Cutters for squares, flats, hexagons and irregular shapes. Cotter Pin Machines, Buckle Tongue Machines, Staple Machines of all kinds. Special Automatic Machinery.



Textile Manufacturers Can Save Money

by using Greening's Wire Drying Floors.

These floors are staunchly made of our Double Cramped Steel Wire Cloth, and will give longer and more satisfactory service than any other kind of drying floor made

GREENING'S
Cotton and Wool Drying Floors

have an established reputation for superiority of material and workmanship.

They are produced in Canada's oldest and best equipped wire-working plant.

Our immense output enables us to quote very close prices in all our lines.

WRITE US FOR CATALOGUE NO. 2 AND SAMPLES.

The B. Greening Wire Co., Ltd.
Hamilton, Ont. **Montreal, Que.**

"D.L." Standard Metal LOCKERS



reduce fire insurance rates, protect your employees from contagion, and prevent petty thefts that are bound to occur where lockers are not used. They are compact and save in floor space.

Keep better feeling in your shop by introducing convenience for the benefit of your employees—nothing will pay you better.

"D.L." Lockers are well finished, strong and durable.

Write for details and prices

Dennis Wire & Iron Works Co.
Limited
London - Canada

Machinery Wanted and For Sale

FOR SALE.

FOR SALE—Engines and Boilers

SECOND HAND	H.P.
One 16x42 in. L.H. Corliss "Reynolds"	175
One 16x20 in. L. H. Slide Valve "Wickes"	100
One 13x20 in. R.H. Slide Valve "McDonald & Sons"	50
One 12x20 in. R.H. Box Bed Top Slide V.	50
One 12x20 in. L.H. Slide Valve	50
One 12x16 in. L.H. Tangye Bed Side Slide Valve	60
One 10½x14 in. R.H. Box Bed Side Slide Valve	40
One 10x16 in. R.H. Slide Valve	35
One 6x12 in. R.H. Slide Valve	12
One 14x18 in. Center Crank Slide Valve	70
One 10x12 in. Center Crank Throt. Gov.	35
One 14x20 in. L.H. Automatic "Atlas"	100
One 11x15 in. R.H. Automatic "Atlas"	50
One 10x18 in. R.H. Automatic "Buckeye"	60
One 7x8 in. Automatic "Climax	16
One 12 & 22x36 in. Poppet Valve Compound "Norberg"	200
One 9⅝x15⅝x12 in. Vertical Compound	125
One 7x8 in. Slide Valve	15
One 6x8 in. Centre Crank Auto. (Payne)	15
One 6x8 in. Upright	8
One Pair 6x8 in. Upright Direct Acting Elevator	16

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One 5½x16 ft. Return Tubular, 68—4-in. tubes	100
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Two 5x16 ft. Ret. Tub., 46—4-in. tubes	80
One 5x15 ft. Ret. Tub., 48—4-in. tubes	70
One 54-in. x 15-ft. Ret. Tub., 58—3½-in. tubes	65
One 42"x12' Ret. Tub., 40—3-in. tubes	30
One 36"x9' 8" Ret. Tub., 28—3-in. tubes	20
One 24"x5' upright Tub., 27—2-in. tubes	5
One 48"x14' Fire Box, 34—3½-in. tubes	40
One 42"x9' 3" Fire Box, 38—3-in. tubes	20
One 42"x8' 6" Fire Box, 52—2½-in. tubes	25
Three 44"x6' 6" Upright, 52—3-in. tubes	25
One 36"x8' Upright, 65—2-in. tubes	16
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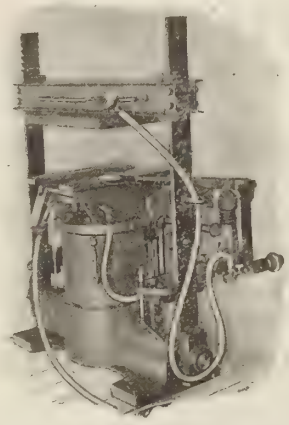
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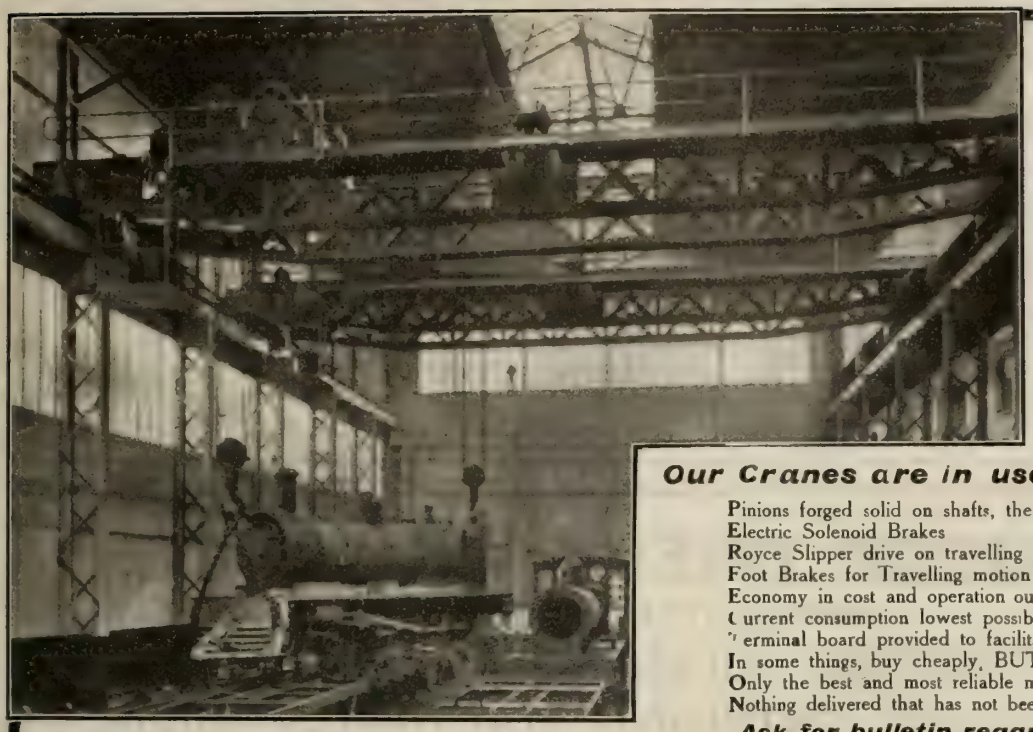
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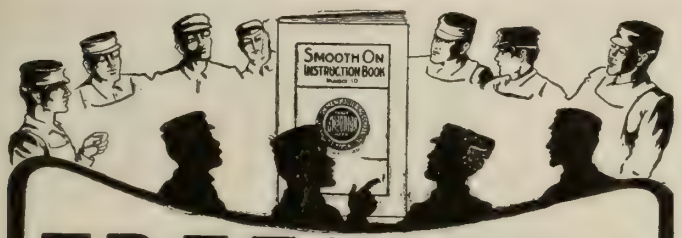
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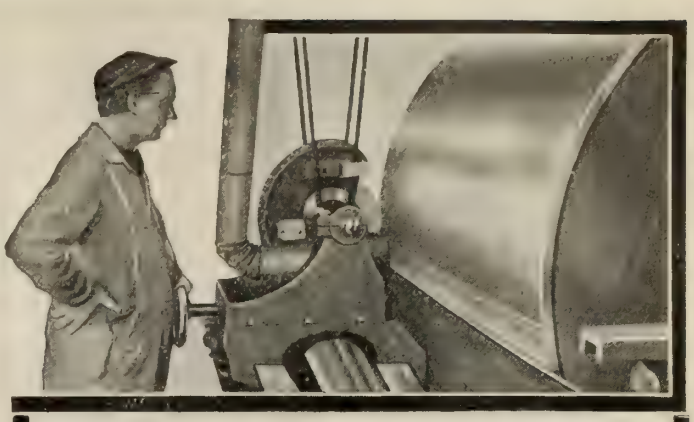
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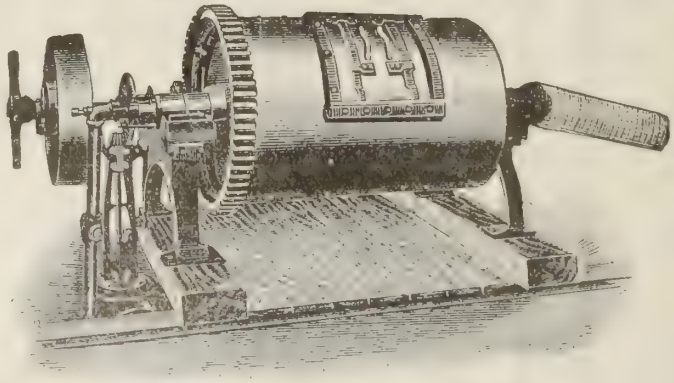
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Twist Drills

will do your work as you want it done.

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Our goods are handled by---Rice Lewis & Son, Ltd., Toronto; Aikenhead Hardware Co., Ltd., Toronto; Frothingham & Workman, Montreal; Mechanics Supply Co., Quebec.

Three Minutes' Grinding puts a new and stronger tang on the shank. It fits the lower slot in the socket.



What Do Your Twisted-Off Tangs Cost?

Keep account for a time of the new drills used to replace those thrown into the scrap heap because of twisted-off tangs, and you will see. These scrapped drills are all right in every other respect.

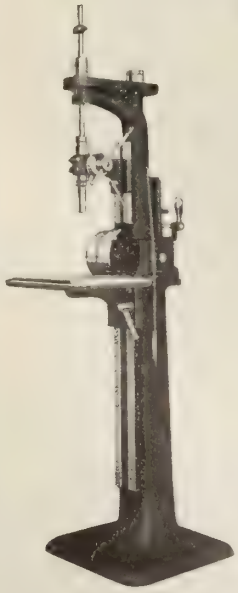
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gives a simple, effective, and inexpensive means of eliminating this cost and putting the drills back in money-earning shape. **Write for Folder A.**

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OF HIGHEST EFFICIENCY



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FOR DRILLING HOLES ¾ INCH AND UNDER

They have rigidity for heavy work and power to drive high speed steel drills to the limit of endurance.

Compact in shape, only the minimum floor space is required; silent chain and positive gear drive replace the usual belts; every operating convenience to save time and labor.

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ROCK ISLAND, QUE. DERBY LINE, VERMONT

CANADIAN MACHINERY BUYERS' DIRECTORY

To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

To Our Advertisers—Send in your name for insertion under the heading of the lines you make or sell.

To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

Abrasive Materials.
The Canadian Fairbanks Co., Montreal.
Canadian Hart Wheels Ltd., Hamiltou.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Toronto
Foss & Hill Machinery Co., Montreal
Stevens, F. B., Detroit Mich.

Air Hose.
Cleveland Pneumatic Tool Co., Cleveland

Air Receivers.
Canadian Rand Co., Montreal.
Mussens, Limited, Montreal

Aluminum.
Parke & Leith, Toronto
Tallman Brass & Metal Co., Hamilton

Aquadag
Acheson Oildag Co., Sarnia, Ont.

Arbors.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O.
Standard Tool Co., Cleveland, O

Arbor Presses.
Niles-Bement-Pond Co., New York.

Automatic Chucks.
Garvin Machine Co , New York

Automatic Index Milling Machines.
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
National Mach. & Supply Co., Hamilton

Automatic Machinery.
Gardner, Robt. & Son, Montreal
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton

Automobile Rims.
Standard Welding Co., Cleveland, O.

Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Babbitt Metal.
Canada Metal Co., Toronto.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Lumen Bearing Co., Toronto.
Magnolia Metal Co., New York
Tallman Brass & Metal Co., Hamilton

Ball Bearings.
Chapman Double Ball Bearing Company, Toronto
John Millen & Son, Ltd., Montreal

Balls, Steel.
Hermann Boker & Co., Montreal
John Millen & Son, Montreal

Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Belting, Chain.
The Canadian Fairbanks Co., Montreal
Jones & Glassco, Montreal
John Millen & Son, Montreal
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Dominion Belting Co., Hamilton.
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa

Belting, Leather.
The Canadian Fairbanks Co., Montreal.
General Supply Co of Canada, Ottawa
J. L. Goodhue & Co., Danville, P.Q.
Imperial Waste & Metal Co., Montreal
McLaren, J. C., Montreal.
National Mach. & Supply Co., Hamilton
Sadler & Haworth, Montreal

Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
Bertrams Limited, Edinburgh, Scotland
Bliss, E. W., Co., Brooklyn, N.Y.
General Supply Co. of Canada, Ottawa
Jardine, A. B. & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Long & Alstatter Co., Hamilton, O
Mussens, Limited, Montreal
National Machinery Co., Tiffin, Ohio.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Boilers.
Canadian General & Shoe Machinery Co., Levis, Que.
General Supply Co of Canada, Ottawa
Goldie & McCulloch Co., Galt.
Mussens Limited, Montreal.
National Mach & Supply Co., Hamilton
Owen Sound Iron Works Co., Owen Sound
Robb Engineering Co , Amherst, N. Scotia Eng. Company, Montreal
Standard Engineering, Co., Toronto.
Waterous Engine Works Co., Brantford.

Boiler Compounds.
Hall Engineering Works, Montreal.

Boiler Feed Regulators.
Standard Engineering Co., Toronto.

Boiler Makers' Supplies.
Jno. F. Allen Co., New York

Boiler Mountings.
Standard Engineering Co., Toronto.

Boiler Settings.
Harbison-Walker Refractories Co., Pittsburg

Bolt and Nut Machinery.
John Bertram & Sons Co., Dundas, Ont.
Foss & Hill Machinery Co , Montreal
Gardner Robt. & Son, Montreal
General Supply Co. of Canada, Ottawa
Joshua Heap & Co., Ltd., Ashton-under-Lyne, Eng.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal,
National Machinery Co., Tiffin, Ohio.
National Mach. & Supply Co , Hamilton
Niles-Bement-Pond Co. New York.

Boring Machines, Upright.
John Bertram & Sons Co., Dundas, Ont.
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Springfield Machine Tool Co., Springfield, O.

Boring Machines, Pneumatic.
The Canadian Fairbanks Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
General Supply Co. of Canada, Ottawa
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.

Boring and Turning Mills.
John Bertram & Sons Co., Dundas, Ont.
Bullard Machine Tool Co., Bridgeport, Conn
Foss & Hill Machinery Co., Montreal.
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Francis Hyde & Co., Montreal.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland.
Francis Hyde & Co., Montreal.

Brake Shoes.
Canadian Steel Foundries, Montreal

Brass Working Machinery.
Gardner Robt., & Son Montreal
General Supply Co. of Canada, Ottawa
Mussens Limited Montreal.
National Mach. & Supply Co., Hamilton
Warner & Swasey Co., Cleveland, Ohio.

Brazing Compounds.
Phillips-Laffitte Co., Philadelphia

Buckets, Clam Shell & Grab.
Browning Engineering Co., Cleveland, O.
Whiting Foundry Equipment Company, Harvey, Ill.

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Foss & Hill Machinery Co., Montreal
London Mach. Tool Co., Hamilton, Ont
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Burners, Fuel Oil and Natural Gas.
Rupert G. Bruce Co., Ltd., Toronto
Francis Hyde & Co., Montreal
W. S. Rockwell Co., New York
Whiting Foundry Equipment Co., Harvey, Ill.

Burrs, Iron and Copper.
Parmenter & Bullock Co , Gananoque

Calipers.
Schuchardt & Schutte, New York

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y
National Mach. & Supply Co., Hamilton

Capstans
Royce, Ltd., Toronto.

Car Replacers.
Canadian Steel Foundries, Montreal
Montreal Steel Works, Montreal
Mussens, Limited, Montreal

Car Wheels, Mine.
Canadian Steel Foundries, Montreal

Cars, Industrial.
Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Francis Hyde & Co., Montreal.
Mussens Limited Montreal.
Sheldons, Limited, Galt
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Lumen Bearing Co., Toronto
Tallman Brass & Metal Co., Hamilton

Castings, Brass.
Hall Engineering Works, Montreal.
Lumen Bearing Co., Toronto
Owen Sound Iron Works Co., Owen Sound.
Tallman Brass & Metal Co., Hamilton
Waterous Engine Works Co. Brantford

Castings, Grey Iron.
Gardner, Robt. & Son, Montreal
Hall Engineering Works, Montreal.
Owen Sound Iron Works Co., Owen Sound
Springfield Machine Tool Co., Springfield, O.
Waterous Engine Works Co., Brantfor

Castings, Steel and Manganese Steel.
Canadian Steel Foundries, Montreal

Castings, Malleable.
Galt Malleable Iron Co., Galt
Pratt & Letchworth, Brantford
Smiths Falls Malleable Castings Co., Smiths Falls

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Cement, Iron.
Shelton Metallic Filler Co., Derby, Conn

Cement Machinery.
The Canadian Fairbanks Co., Montreal
Gardner, Robt. & Son, Montreal
National Mach. & Supply Co., Hamilton
Owen Sound Iron Works Co., Owen Sound.
Waterous Engine Works Co., Brantford

Centering Machines.
John Bertram & Sons Co., Dundas, Ont
Foss & Hill Machinery Co., Montreal
Gardner Robt. & Son, Montreal
General Supply Co of Canada, Ottawa
London Mach Tool Co., Hamilton, Ont.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
Pratt & Whitney Co , Hartford, Conn.
Waterous Engine Works Co , Brantford.

Chain Blocks.
Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
General Supply Co. of Canada, Ottawa
John Millen & Son, Montreal
Mussens Limited, Montreal.
National Mach. & Supply Co , Hamilton
Schuchardt & Schutte, New York

Chucks, Drill, Lathe and Universal.
John Bertram & Sons Co., Dundas, Ont.
Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn
Foss & Hill Machinery Co., Montreal
Gardner Robt. & Son, Montreal
General Supply Co. of Canada, Ottawa
S. E. Horton Machine Co., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York
Standard Tool Co., Cleveland, O
Stevens Co., Galt, Ont.
Union Mfg. Co., New Britain, Conn.

Chucking Machines.
The Garvin Machine Co., New York
Niles-Bement-Pond Co., New York.
Springfield Machine Tool Co., Springfield, O.
Warner & Swasey Co , Cleveland, Ohio

Circuit Breakers.
Canadian Westinghouse Co., Hamilton.

Cloth and Wool Dryers.
Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Clutches.
Positive Clutch & Pulley Works, Toronto

Coal Boring and Cutting Machines.
Canadian Rand Co., Montreal

Coal Handling Machinery.
Browning Engineering Co., Cleveland, O.
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford

Collectors, Pneumatic.
Sheldons Limited, Galt

Collets, Milling Machine.
The National Tool Co., Cleveland, O.

Compressors, Air.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

Concentrating Plant.
Gardner, Robt. & Son, Montreal

Concrete Mixers.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton

Concrete, Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co., Hamilton
Steel and Radiation, Toronto

Condensers.
Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co , Brantford.

Consulting Engineers.
Hall Engineering Works, Montreal.
Robertson, J. M., Ltd., Montreal
Standard Engineering Co., Toronto

Controllers and Starters Electric Motor.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Counterbores and Countersinks.
Cleveland Twist Drill Co., Cleveland
General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O.
Standard Tool Co., Cleveland, O

Couplings.
Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound

Couplings, Air Hose.
Canadian Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago

Cranes, Locomotive.
Browning Engineering Co., Cleveland, O
Mussens, Limited, Montreal

Cranes, Traveling, Electric and Hand Power.
Advance Machine Works, Walkerville, Ontario
Mussens, Limited, Montreal
Northern Eng. Works, Detroit, U.S.A.
Royce, Ltd., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Wrecking.
Browning Engineering Co. Cleveland

Crank Pin Turning Machine.
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crossings, Diamond Rail.
Canadian Steel Foundries, Montreal

Crushers, Rock or Ore.
Foss & Hill Machinery Co., Montreal
Mussens, Limited, Montreal
Waterous Engine Works Co., Brantford.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago Ill.

Cutters, Pipe.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Trimont Mfg. Co. Roxbury, Mass.

Cutter Grinders and Attachments
Cincinnati Milling Machine Co., Cincinnati
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
Modern Tool Co., Erie, Pa.
Mussens, Limited, Montreal

Cutters, Milling.
Becker Milling Machine Co., Hyde Park Mass
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co. New Bedford
Mussens Limited, Montreal.
National Tool Co., Cleveland, O.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland O

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co. Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
Joshua Heap & Co., Ltd., Ashton-under-Lyne Eng
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Tool Co., Cleveland, O.
Pratt & Whitney Co., Hartford, Conn.
L. S. Starrett Co., Athol, Mass

Damper Regulators.
The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal
Standard Engineering Co., Toronto.

Dies and Die Stocks.
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Foss & Hill Machinery Co., Montreal
Gardner, Robt. & Son, Montreal
General Supply Co of Canada, Ottawa
Jardine, A. B. & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford
Russell Machine Co., St. Catharines, Ont
Ernest Scott, Montreal

Die Castings.
Tallman Brass & Metal Co., Hamilton

Die Linkers.
Garvin Machine Co., New York

Dies, Self-opening.
Geometric Tool Co., New Haven, Conn.

Dies, Opening.
W. H. Banfield & Sons, Toronto
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Sheet Metal Working
E. W. Bliss Co., Brooklyn, N.Y.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co. Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

Dredging Machinery.
Browning Engineering Co., Cleveland
Mussens, Limited, Montreal

Drift Bolt Cutters.
Cleveland Pneumatic Tool Co., Cleveland

Drill Presses.
W. F. & John Barnes Co., Rockford, Ill.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co. New York
General Supply Co. of Canada, Ottawa
Mussens, Limited, Montreal

Drilling Machines, Locomotive and Multiple Spindle.
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Pulley Machinery Co., Cincinnati, O.
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton, Ont.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.
John Bertram & Sons Co., Dundas, Ont
The Canadian Fairbanks Co. Montreal
Drummond Bros., Guildford, Eng.
Foss & Hill Machinery Co., Montreal
General Supply Co of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mueller Machine Tool Co., Cincinnati, O.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Sensitive.
W. F. & John Barnes Co., Rockford, Ill.
H. G. Barr, Worcester, Mass
General Supply Co of Canada, Ottawa
D. McKenzie, Guelph, Ont
Mussens, Limited Montreal
Niles-Bement-Pond Co., New York

Drilling Machines, Upright and Horizontal.
W. F. & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas, Ont
Foss & Hill Machinery Co., Montreal
Gem Mfg. Co., Pittsburg, Pa
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
R. McDougall Co., Galt
Niles-Bement-Pond Co., New York
Springfield Machine Tool Co., Springfield O.

Drills, Bench.
W. F. & John Barnes Co., Rockford, Ill
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn
United States Electrical Tool Co., Cincinnati

Drills, Blacksmith and Bit Stock.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Centre.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
L. S. Starrett Co., Athol, Mass
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Coal and Plaster.
Canadian Rand Co., Montreal
Cumming, J. W., New Glasgow. N.S.

Drills, Corner (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland

Drills, Electric and Portable.
General Supply Co of Canada, Ottawa
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
United States Electrical Tool Co., Cincinnati

Drills, High Speed.
W. F. & John Barnes Co., Rockford, Ill.
Hermann Boker & Co., Montreal
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co, Cleveland
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn
Sibley Machine Tool Co., South Bend, Ind.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines Ont

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland
General Supply Co of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Pneumatic.
John F. Allen Co., New York
Canadian Rand Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co, Chicago.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Chas. Parker & Co., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Rock.
Canadian Rand Co., Montreal.
Mussens, Limited, Montreal

Drills, Track.
Cleveland Twist Drill Co, Cleveland
General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Twist.
The Canadian Fairbanks Co., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Morse Twist Drill and Machine Co. New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co. Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drill Sockets.
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Dry Kiln Cars and Equipment.
Sheldons Limited, Galt

Dump Cars.
Rupert G. Bruce Co., Ltd., Toronto
Browning Engineering Co., Cleveland
The Canadian Fairbanks Co., Montreal
General Supply Co of Canada, Ottawa
Francis Hyde & Co., Montreal.
Mussens Limited Montreal
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford

Dynamos and Electrical Supplies.
The Canadian Fairbanks Co., Montreal
Canadian Westinghouse Co., Hamilton.
Federal Eng. & Supplies, Ltd., Toronto
Hall Engineering Works, Montreal, Que.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton.

Electric Welding.
Standard Welding Co., Cleveland, O.

Elevators and Buckets.
Francis Hyde & Co. Montreal.
Waterous Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery Grinders (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland

Emery and Emery Wheels.
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd., Hamilton.
Garvin Machine Co., New York
Foss & Hill Machinery Co., Montreal
Francis Hyde & Co., Montreal
Mussens, Limited, Montreal
Pittsburg Emery Wheel Co., Pittsburg Pa
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.
Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Gardner, Robt. & Son Montreal
Francis Hyde & Co., Montreal
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton

Engineers, Marine and Mechanical.
Canadian General & Shoe Machinery Co. Levis, Que.

Engines, Marine.
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engineers' Supplies.
Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.
The Canadian Fairbanks Co., Montreal
Fielding & Platt Ltd., Gloucester, Eng.
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
National Mach. & Supply Co., Hamilton
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engines, Steam.
General Supply Co. of Canada, Ottawa
The Goldie & McCulloch Co., Galt, Ont.
Robb Engineering Co., Amherst N.S.
National Mach. & Supply Co., Hamilton
Scotia Eng. Co., Montreal
Sheldons Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Equipment, Shop
Garvin Machine Co, New York

Escutcheon Pins.
Parmenter & Bulloch Co. Gananoque

Exhaust Heads.
The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co, Toronto.

Expanded Metal.
Steel & Radiation Ltd., Toronto

Fans, Electric.
Canadian Westinghouse Co., Hamilton
Foss & Hill Machinery Co., Montreal
Matthews & Yates, Manchester Eng.
Sheldons Limited Galt, Ont.
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.
The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
General Supply Co. of Canada, Ottawa
Robb Engineering Co., Amherst N.S.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford.

Files.
General Supply Co. of Canada, Ottawa
Nicholson File Co., Port Hope, Ont.
Simonds Mfg. Co., Fitchburg, Mass.

Flanges.
Dart Union Co., Ltd., Toronto

Forges.
Francis Hyde & Co., Montreal.
Independent Pneumatic Tool Co. Chicago, Ill.
National Mach. & Supply Co., Hamilton
W. S. Rockwell Co., New York
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.
Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York

Forgings, Drop, Automobile and Locomotive.
Bliss, E. W., Co., Brooklyn N.Y.
Canadian Billings & Spencer, Ltd., Welland

Forging Hammers, Pneumatic
E. W. Bliss, Co., Brooklyn, N.Y.

Forging Machinery.
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co., Toronto

Friction Clutch Pulleys, etc.
The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs.
Canadian Steel Foundries, Montreal

Furnaces, Steel Heating.
Standard Engineering Co., Toronto
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.
Sheldons Limited, Galt.

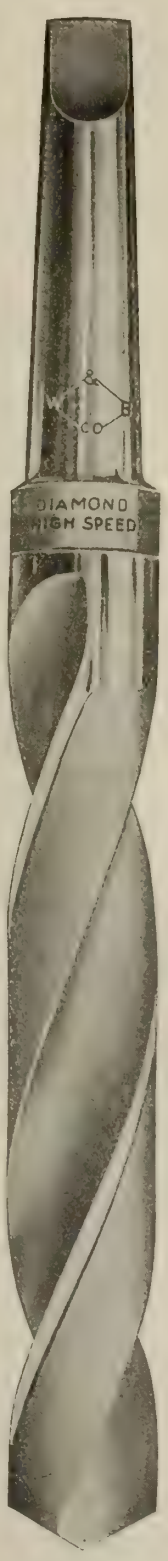
Gas Producer Linings.
Harbison-Walker Refractories Co., Pittsburg

Gas Producer Plants.
The Canadian Fairbanks Co., Montreal
Fielding & Platt Ltd., Gloucester, Eng

Gauges, Standard.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn

Gear-Cutting Machinery.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens, Limited, Montreal
Morse Twist Drill and Machine Co., New Bedford
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York

Gears, Cut, Mortise, Angle Worm
Armstrong Bros., Toronto
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Hamilton Gear & Machine Co., Toronto
John Millen & Son, Montreal
New Process Raw-Hide Co., Syracuse.
Waterous Engine Works Co., Brantford



WHY HESITATE?

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Your factory cost sheets tell the story of excessive manufacturing expense, lost production and imperfect products.

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Mussens, Limited, Montreal

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Mussens, Limited, Montreal
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Standard Tool Co , Cleveland, O

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Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

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National Mach. & Supply Co., Hamilton
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Robb Engineering Co., Amherst, N.S.
Waterous Engine Works, Brantford

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General Supply Co. of Canada, Ottawa

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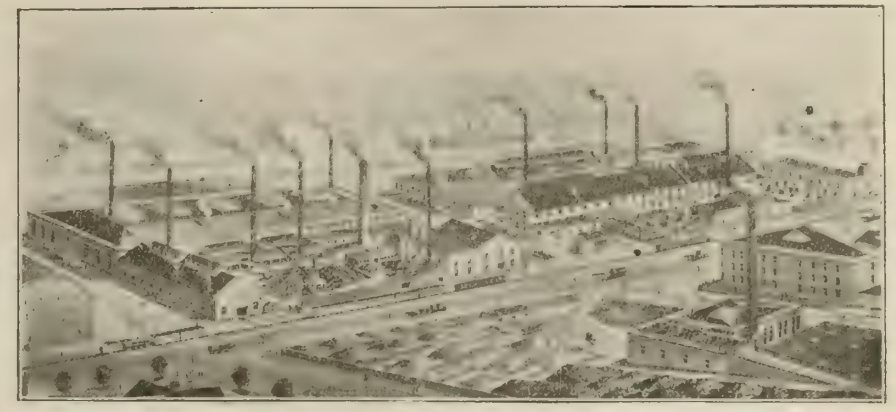
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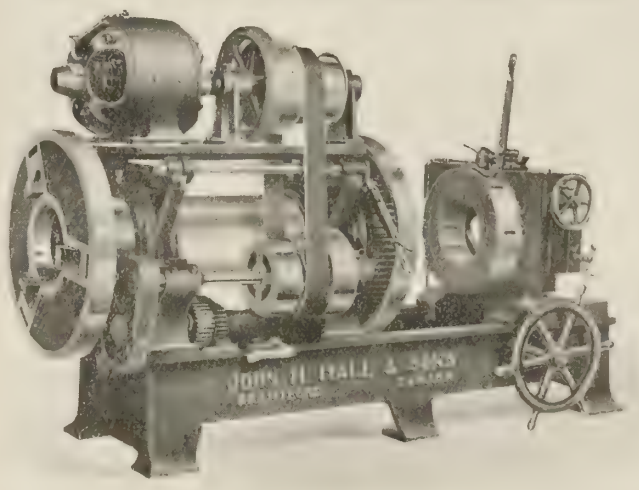
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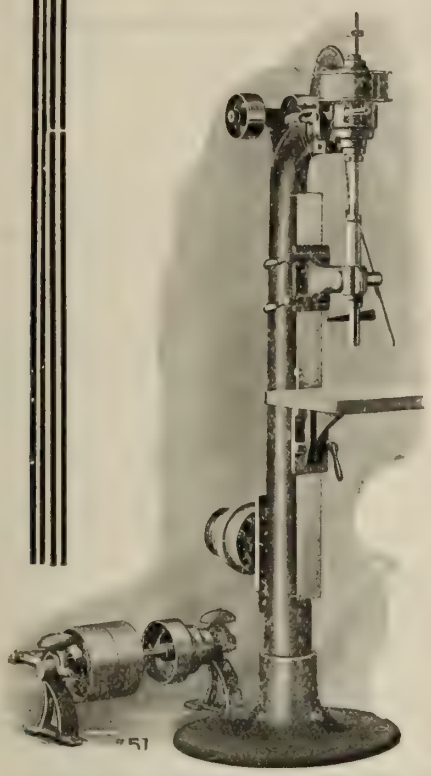
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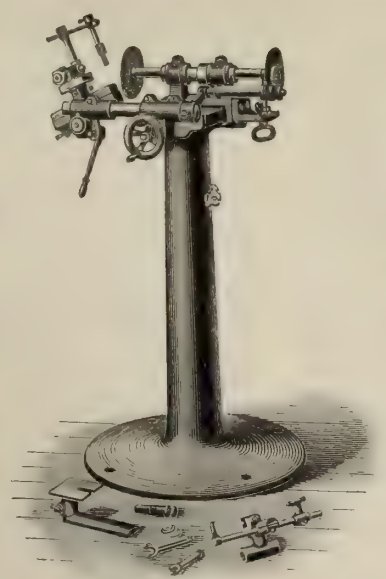
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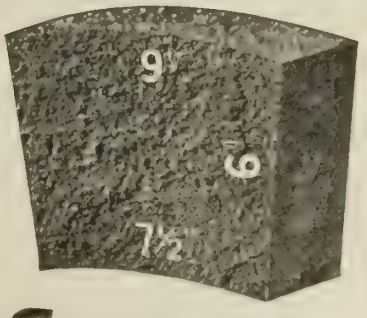
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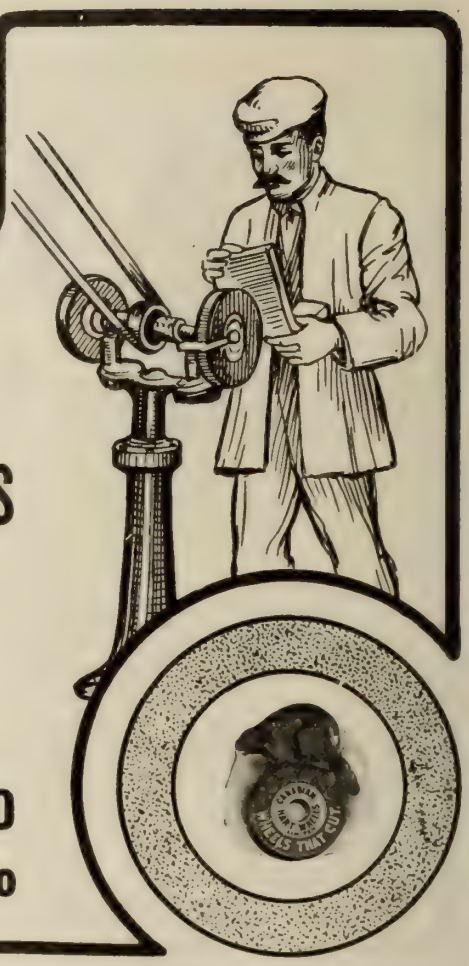
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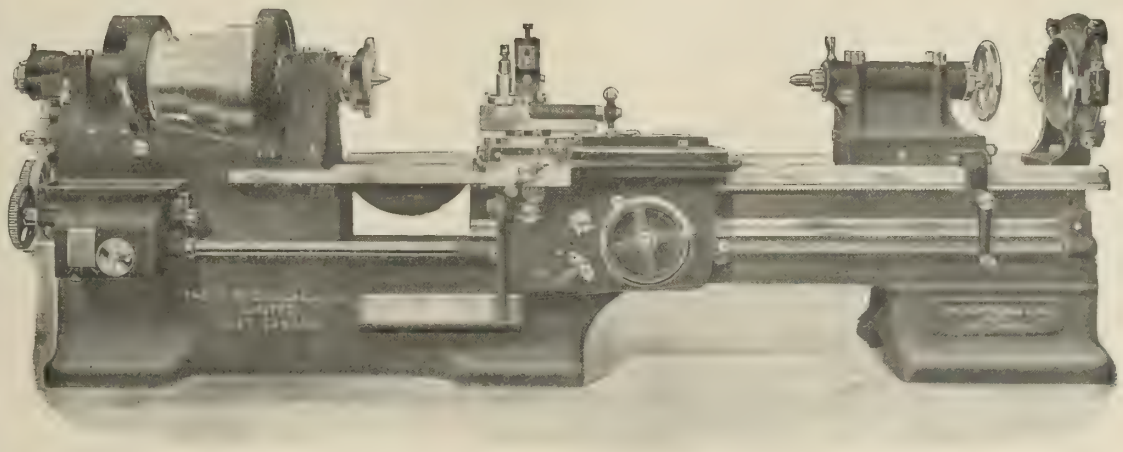
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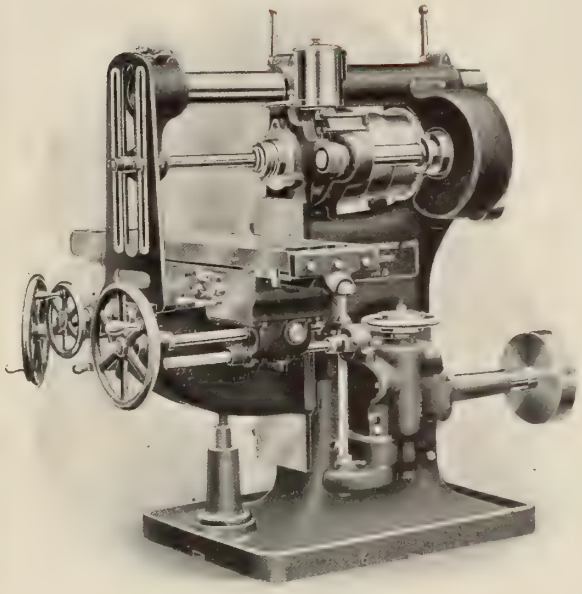
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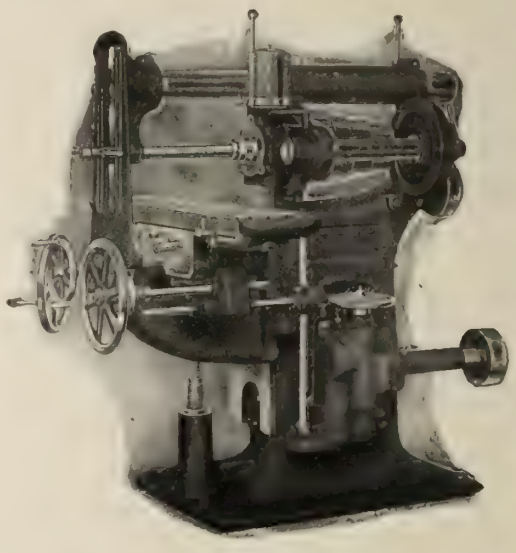
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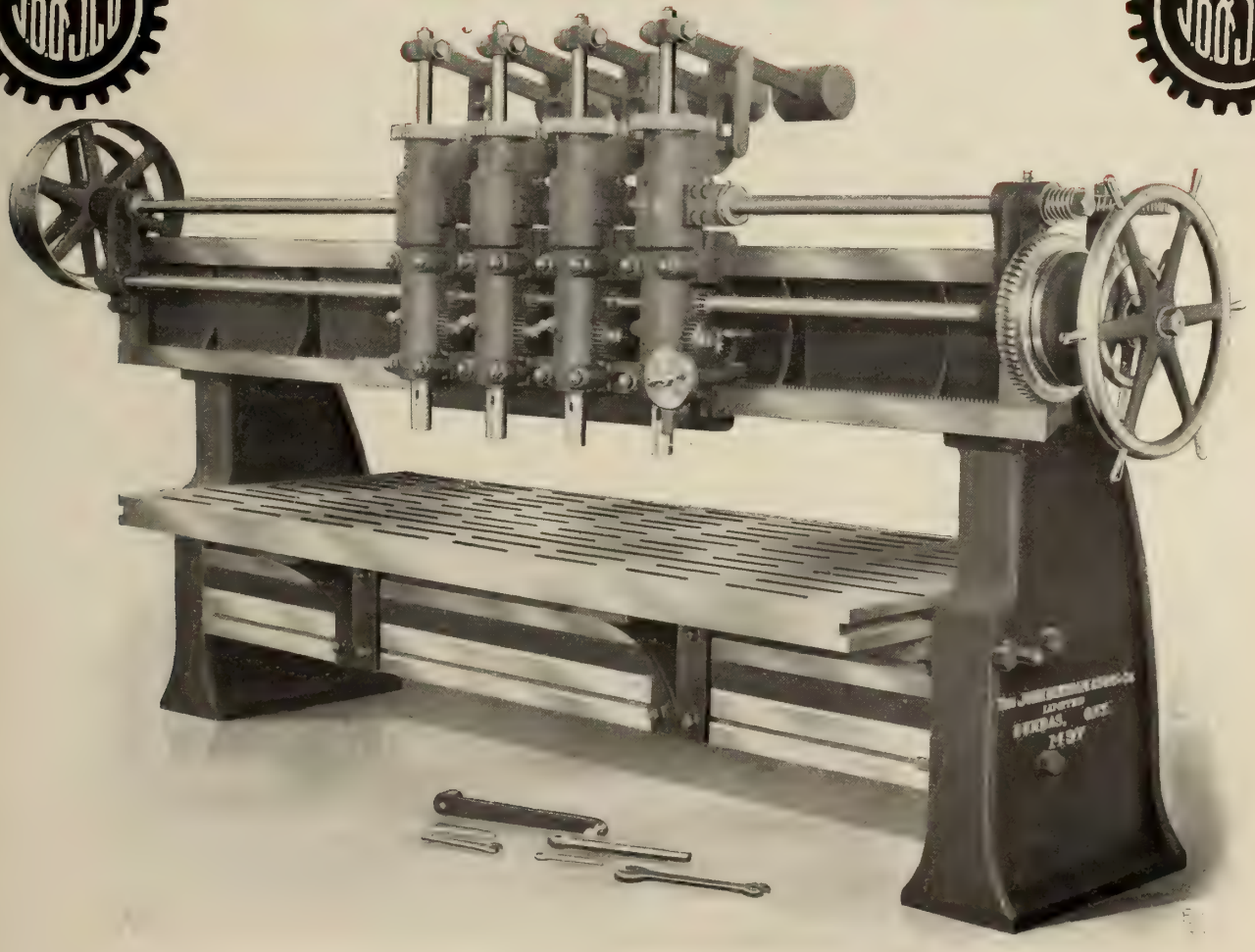
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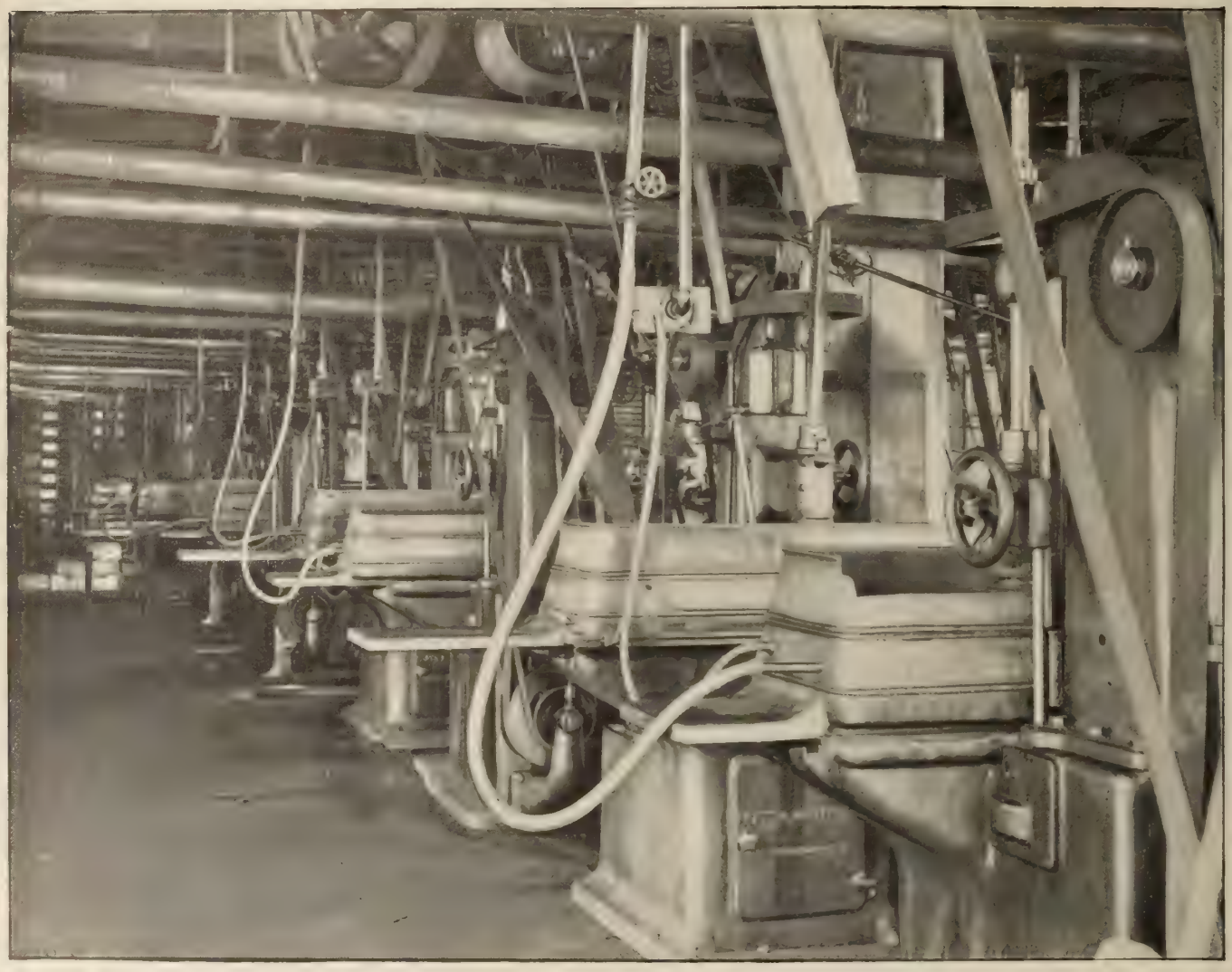
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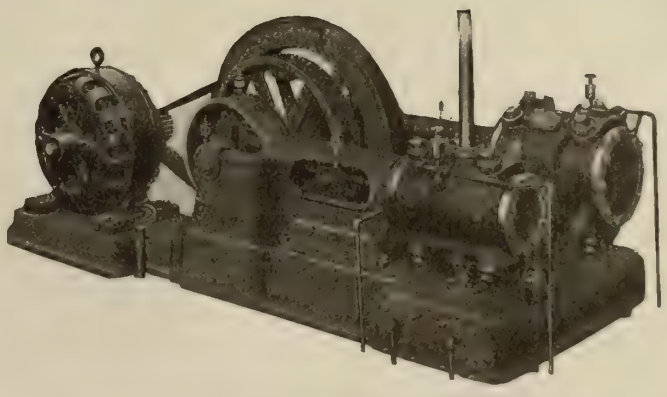
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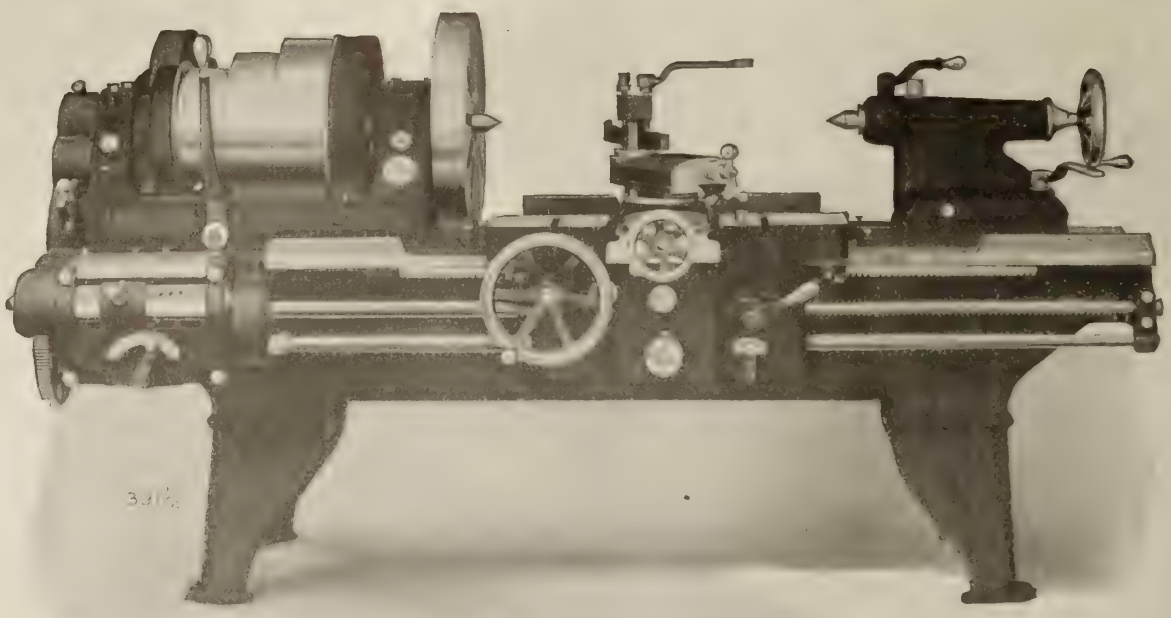


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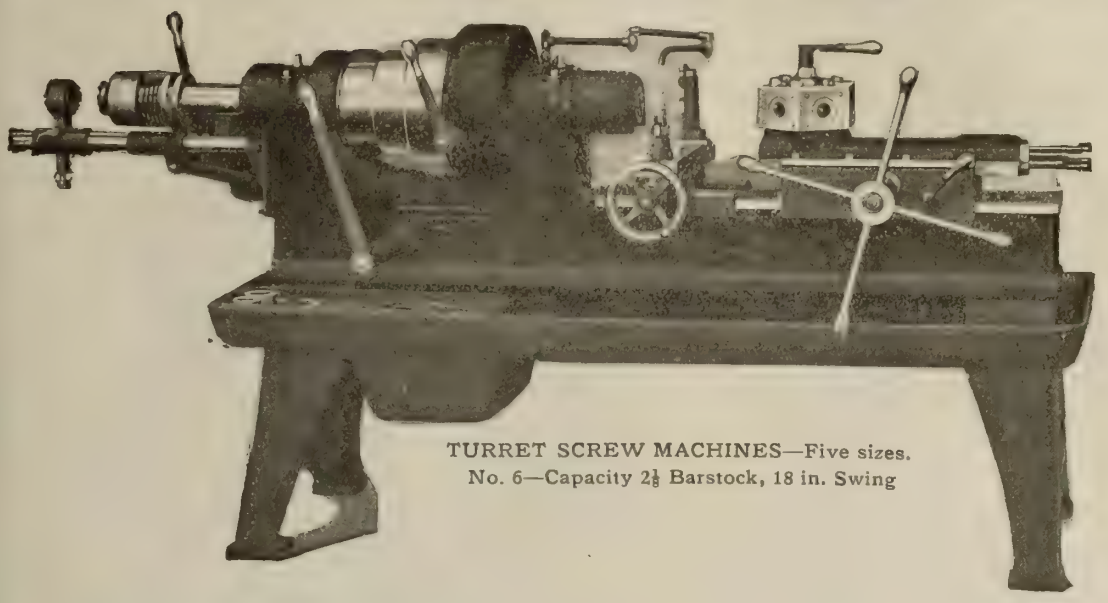
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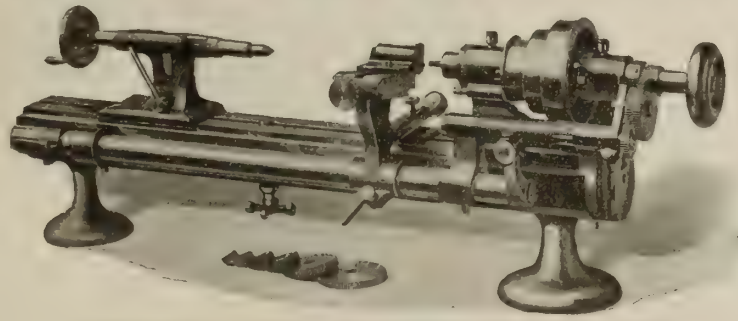
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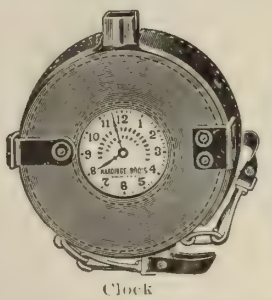
The Warner & Swasey Company, Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams and Wilson, Montreal

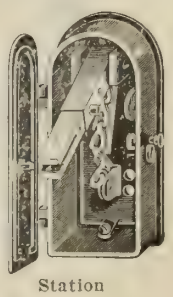
THE HARDINGE LINE



Hardinge No. 3 Bench Lathe, showing Chasing Attachment.



Clock



Station

Beyer Watchman's Clock for Factories, Lumber Yards or Town Patrol.



3



2

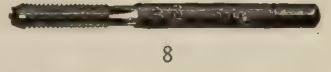


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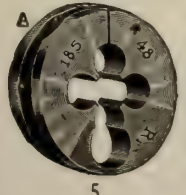


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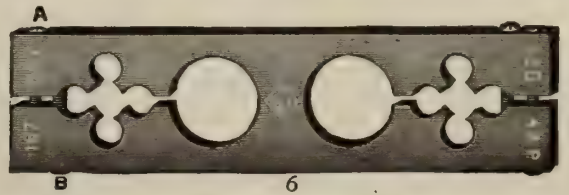
TRADE H DALE B MARK



8



5



B 6



4

Taps and Dies of special sizes, English or Metric Pitches.

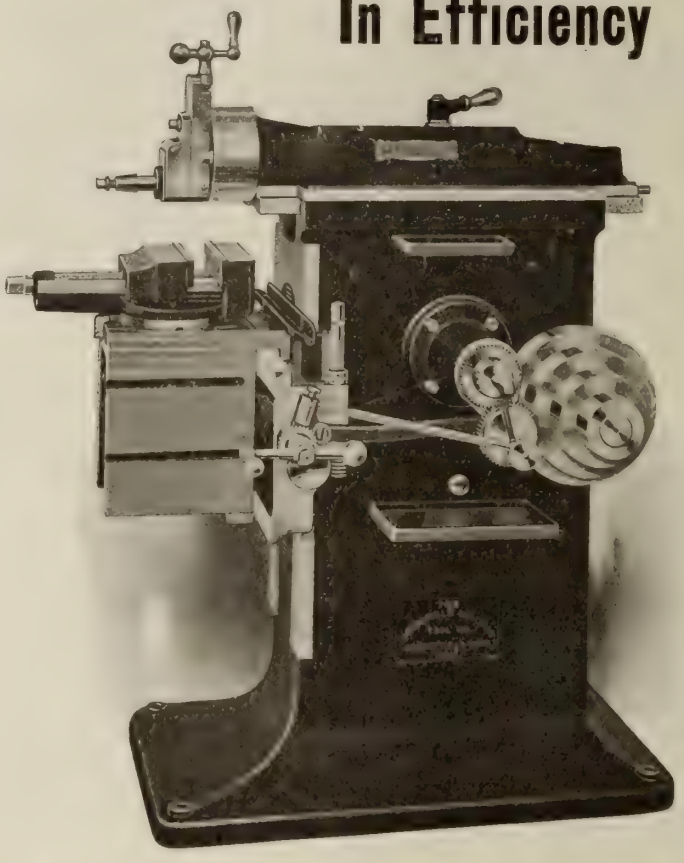
Write for Catalogs

Hardinge Bros. Inc.

3133-3141 Lincoln Ave.
CHICAGO, ILL.

Among The Smallest In Size But The Greatest In Efficiency

Springfield
12-Inch Crank Shaper

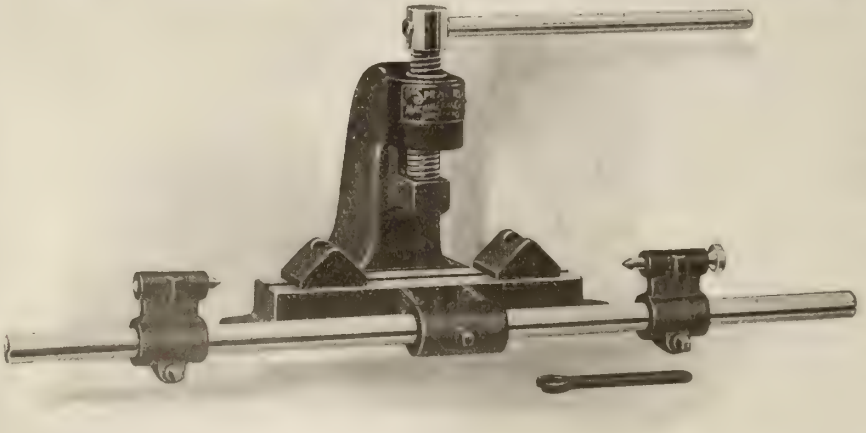


While small in stroke this Shaper is heavy and substantially built. The same care is used in its construction as is shown in any of our higher priced tools.

Nearly a quarter of a century's experience is back of Springfield Shapers. And our shapers are noted for their *simplicity*.

Consider these points about the 12-inch Crank Shaper. The vises have steel-faced jaws and a graduated circular base to permit of their adjustment to any required angle, and may be secured to top, face or side of the table. All the handles for operating the machine are placed in accessible positions, and so arranged that any adjustment, either of stroke or position of cross-rail, may be made while the machine is in motion. It is unnecessary to adjust the feed for different heights of cross-rail because it is made to adjust itself *automatically*. Write us for circular No. 111.

This Bench Straightening Press Saves Time and Energy



If you have our Bench Straightening Press you can straighten the work and test it right on the bench.

Compute the time it takes your men to carry their heavy loads from bench to lathe and vice-versa. Consider the time it takes to straighten work with a hammer, and the *loss* of time involved in testing it and perhaps carting it back again to be done all over.

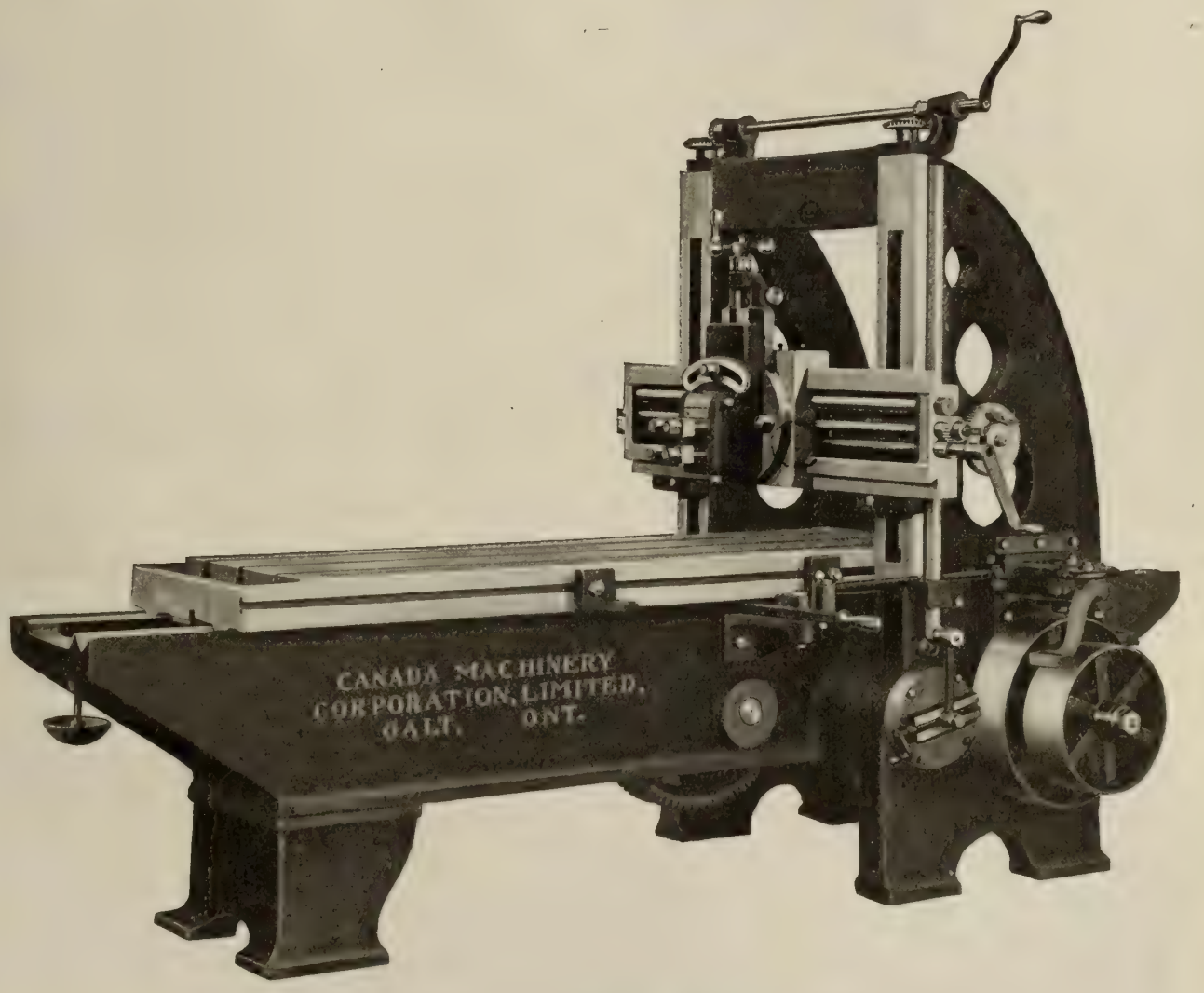
There's only *one* sensible way of looking at the question. Our Bench Straightening Press has its own testing centres, and the fist straightening process is also the final. The work will be absolutely accurate and will remain so in the lathe. Straightened right at the bench. *Write for Circular No. 101.*

The Springfield Machine Tool Co.
SPRINGFIELD : : OHIO, U.S.A.

Canadian Agents, MUSSENS LIMITED, Montreal. Toronto, Winnipeg, Vancouver.

CANADA MACHINERY CORPORATION, LIMITED

GALT, ONTARIO



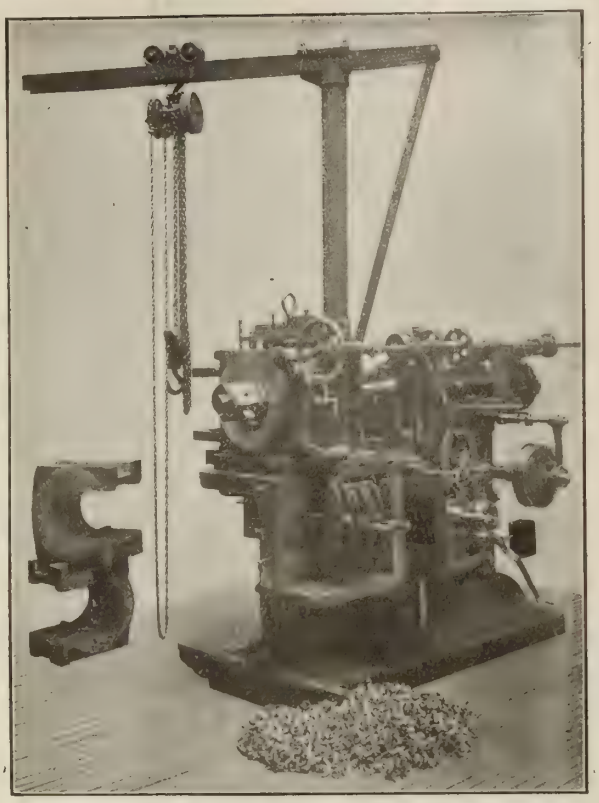
24 in. x 24 in. x 6 ft. Metal Planer.

We build all sizes of Iron or Metal Planers from 24 in. to 72 in., with one, two or four speed countershafts, and constant speed return. Let us have your enquiries for your Iron Tool requirements.

Canada Machinery Corporation, Limited

GALT, ONTARIO

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

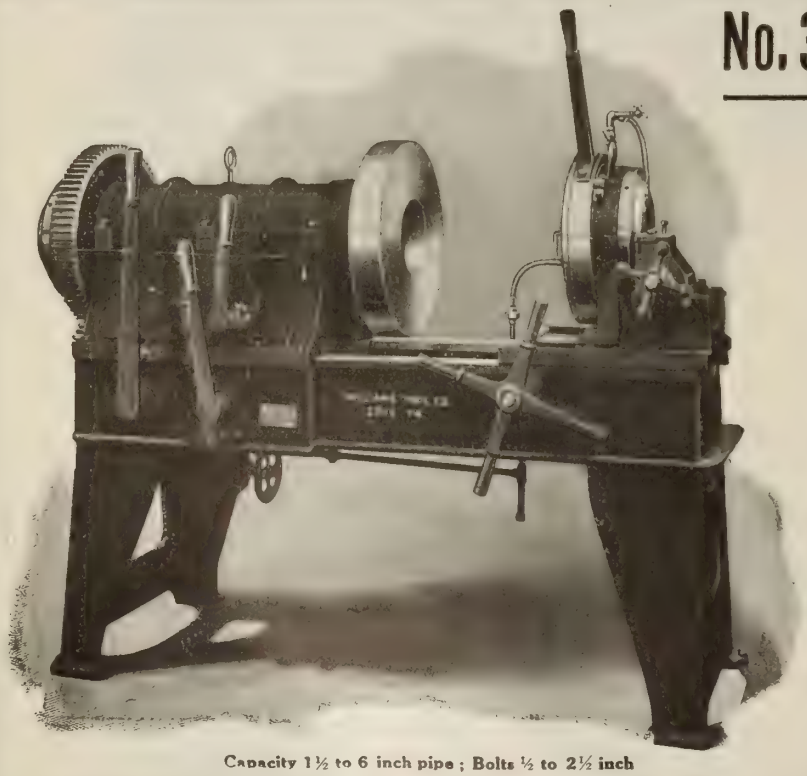
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1½ to 6 inch pipe; Bolts ½ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼″ to 2″; ½″ to 3″; 1″ to 4″; 1½″ to 6″; 2″ to 8″ and 3½″ to 12″.

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

Send for Description and Prices.

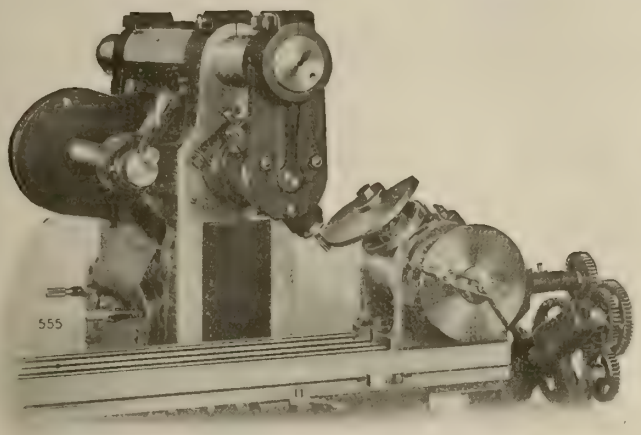
WILLIAMS TOOL CO.

Box 18 **Erie, Pa., U. S. A.**

The advertiser would like to know where you saw his advertisement—tell him.

Milling Screw Machine Cams

The Cincinnati Way



This is one of the jobs that generally puzzles the toolmaker who has to do it right. The difficulty is that the great variety of cams used all require exact leads, most of which cannot be produced by any practical combination of changed gears.

On a Cincinnati you gear the Miller for one of the shorter leads. Then by setting the Dividing Head and the Vertical attachment at an angle you get a mathematical relation between the forward movement of the table, the revolution of the Dividing Head spindle, and the angle to which it is set, which produces the exact lead required.

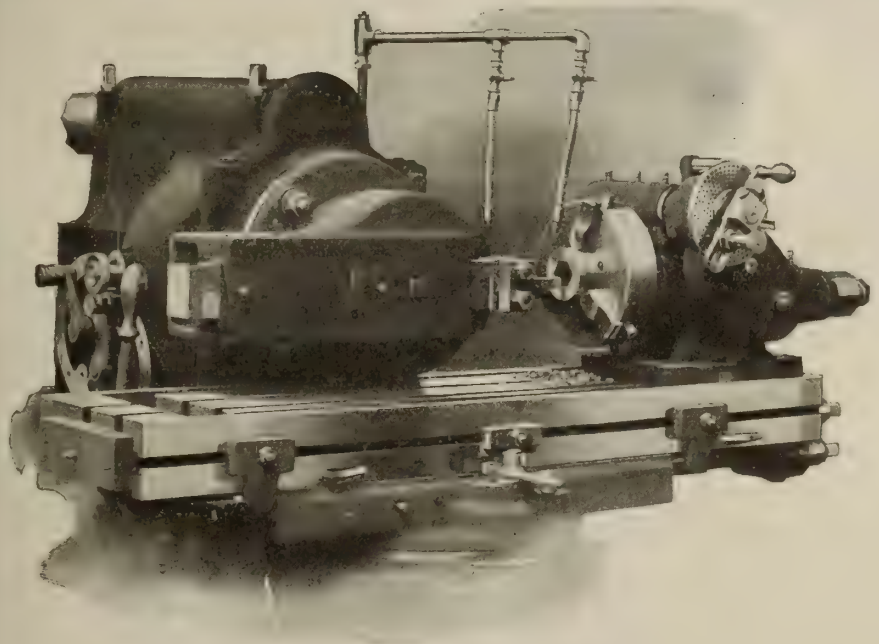
We have figured out all the settings for you for leads, from .6 inch to 6 inch advancing by .001 inch.

You can have these tables for the asking if you are using a MODERN CINCINNATI UNIVERSAL.

The Cincinnati Milling Machine Company

CINCINNATI, OHIO, U.S.A.

Canadian Agent—H. W. PETRIE, Limited, Toronto, Montreal and Vancouver



EVERY tool room should have a Milwaukee Universal Milling Machine, every universal milling machine should have a slotting attachment and every tool room foreman should have our latest book—to be had for the asking.

KEARNEY & TRECKER CO.

MANUFACTURERS MILWAUKEE, WIS.

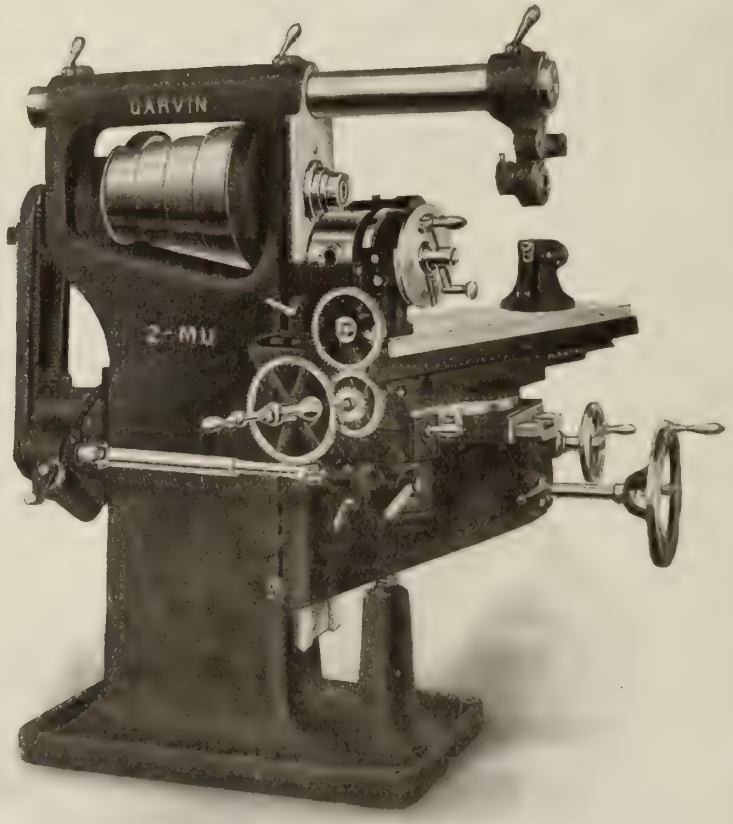
Canadian Agents:—A. R. WILLIAMS MACHINERY CO., Toronto, St. John, Winnipeg, Vancouver
WILLIAMS & WILSON, Limited, Montreal

Are You Looking For a

Universal Milling Machine

That is Chatter Proof and Rigid, Simple to Operate and Capable of Doing Your Work the Way It Should be Done?

If So, A Garvin No. 2 Mfg. Universal Miller Will Fill The Bill



GARVIN No. 2—Mfg. Universal Milling Machine
Use Code.....Antagic

They are rigid and powerful under heavy cuts and are well recommended by users for their rigidity, simplicity, efficiency and powerfulness.

Fitted with our positive feed change box, capable of giving 10 changes of feed, increased to 20 when back gears are in use, securing accelerated feed of table for large diameter of cutters.

Equipped with our **Double-Geared Dividing Head** which has many exclusive features alone:—

WILL DIVIDE

All numbers to	150
All numbers divisible by 2 and 5 to	300
All numbers divisible by 3 to	360

Worm and Dividing Gear undisturbed when using Quick Index.

DIMENSIONS OF MACHINE

Feed of Table	25 in.
Adjustment in line with Spindle	8 in.
Vertical Adjustment	18 in.
Weight	3550 lbs.

IMMEDIATE DELIVERY

Send for Descriptive Circular No. 134.

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

MANUFACTURERS OF

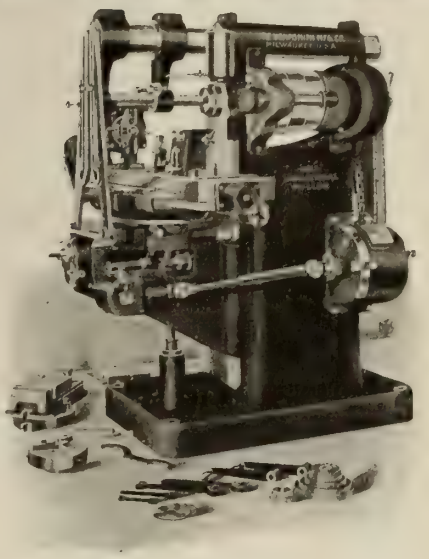
Visitors Welcome

Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Hole, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.



Broad, Continuous Bearing Surfaces give the

KEMPSMITH UNIVERSAL MILLER



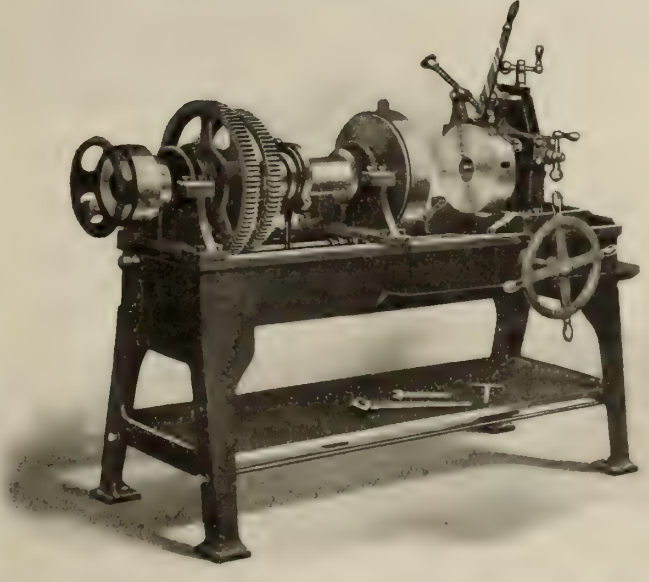
that strength and rigidity which make it good for the same heavy work as the similar size plain MILLER. See the full uninterrupted sweep of bearing of the universal swiveling block on the saddle, clamped rigidly to any position by ONE screw, conveniently located. Where a machine is to be used in a general line of work this point is a vital one.

The KEMPSMITH MFG. COMPANY, Milwaukee, Wis.

Canadian Agents: Rudel-Yeates Machinery Co., Montreal

STRENGTH—DURABILITY—EFFICIENCY

Determining Factors in Bignall & Keeler Design.



Every part of a successful shop must be run on the highest level of efficiency. No one phase of machine tool practice shows more marked advancement than pipe-threading and cutting machines.

We offer our machines as worthy exponents of and oftentimes leaders in this advancement.

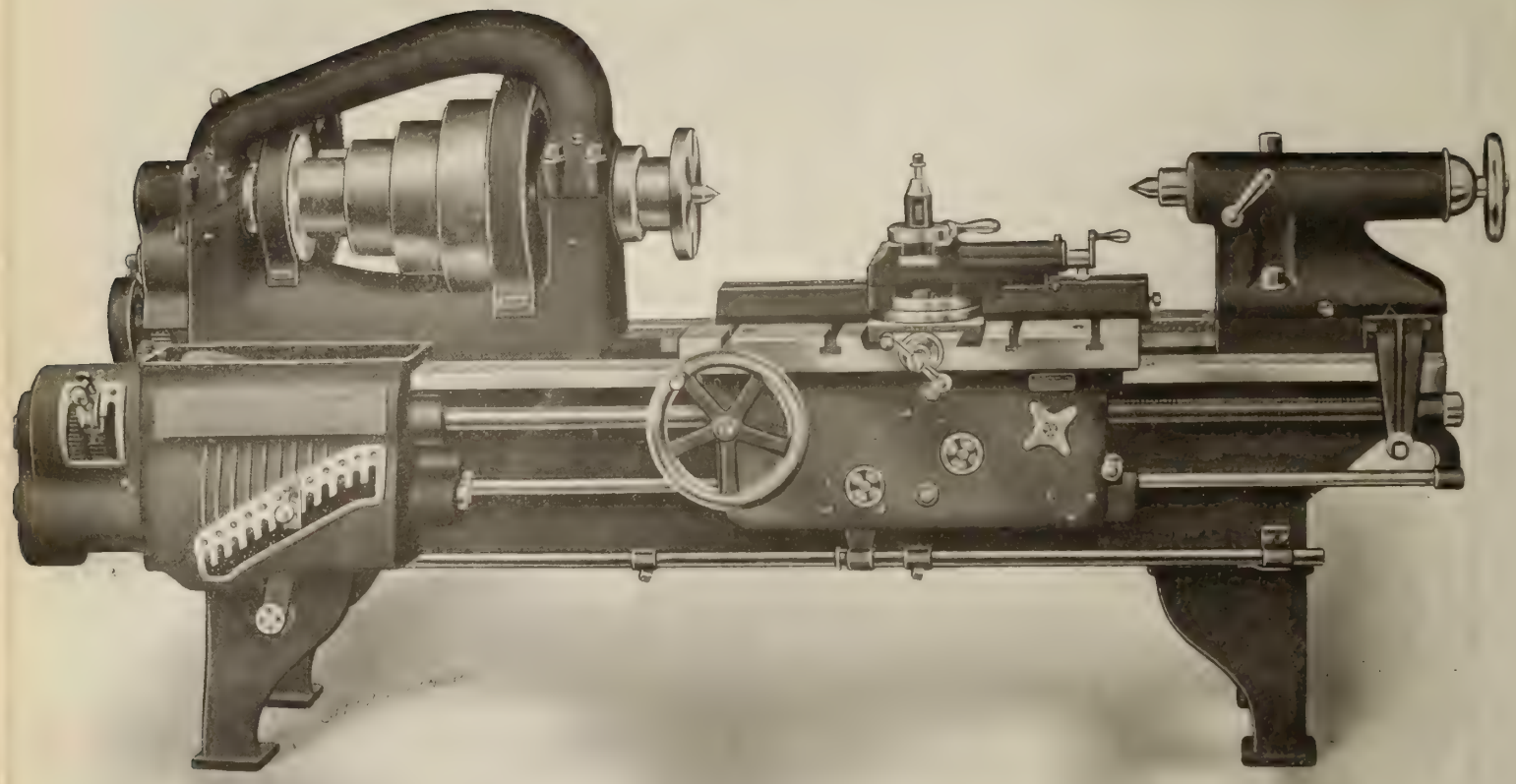
We have striven to obtain the maximum production through ease of operation.

PIPE THREADS CUT IN THE SHOP ARE RIGHT ON THE JOB.

BIGNALL & KEELER MFG. COMPANY

EDWARDSVILLE, ILLINOIS, U.S.A.

Selling Agents for Canada—Canadian Fairbanks Co., Ltd., Montreal, Toronto, St. John, N.B., Winnipeg, Calgary, Vancouver



Hendey 24-inch Improved Engine Lathe

IT has taper journals for spindle, annular bearings for same, and lubrication controlled by ring oilers. It has mounted change gearing, giving 36 different threads and feeds. Threads not shown on index, including metric pitches, can be cut with the aid of a few extra change gears. It has automatic stop for carriage in either direction. Reversing travel controlled by lever located at right hand end of apron, allowing the spindle to run in one direction. Carriage is heavy and substantial but has remarkably easy traverse along bed by means of hand wheel. This easy movement appeals to the operator. Workmanship and accuracy of our machines guaranteed to be the very best.

Send for complete catalogue illustrating all sizes, including Geared Head Lathes

THE HENDEY MACHINE CO.

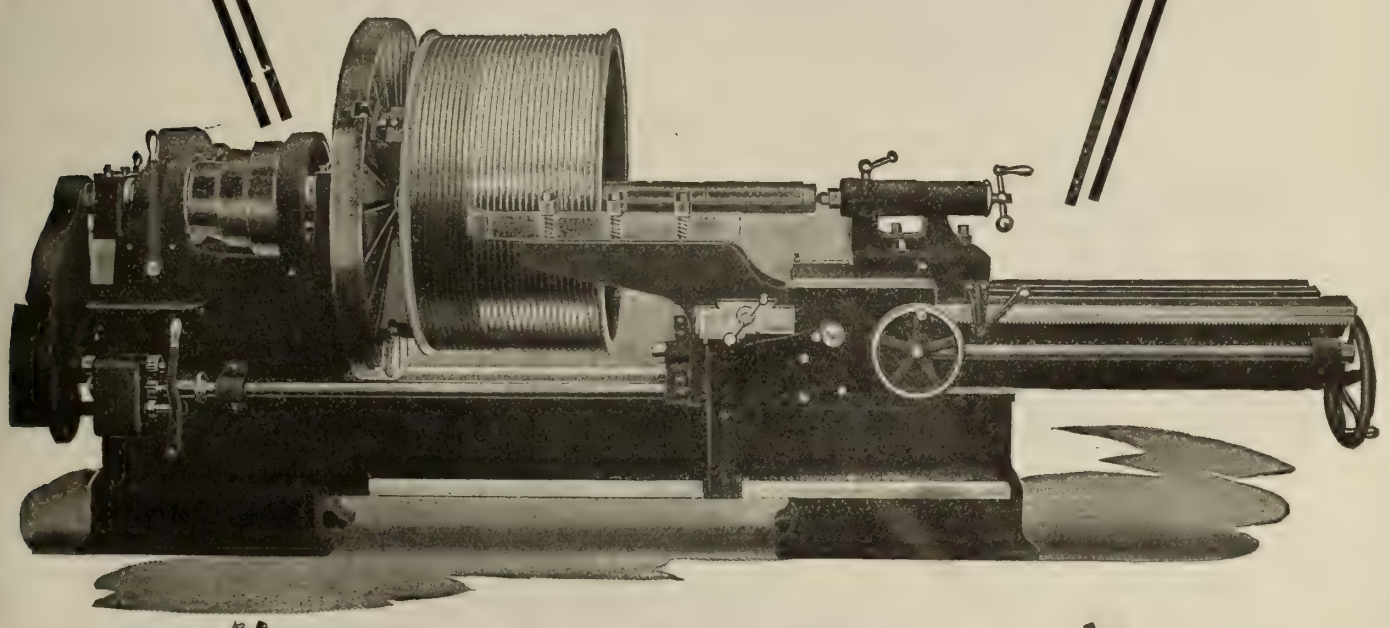
TORRINGTON, CONN., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

24x48" EXTENSION BED
GAP LATHES

The Rahn-Larmon Extension Bed Gap Lathes are designed to meet the requirements of repair and jobbing shops or large plants or mines that are compelled to do their own repair work.

This cut represents our 24x48 in. Extension Bed Gap Lathe, which is practically THREE lathes embodied in ONE machine.



The top bed slides along the lower one, and can be adjusted to any width of gap required within range of the lathe. By moving the upper bed, the distance between centers can also be considerably increased.

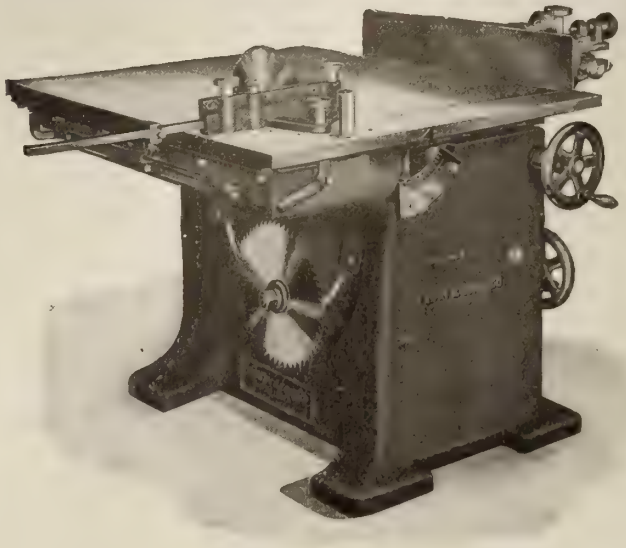
Both beds are very heavy and substantially constructed. Their entire lengths are firmly braced with girders, and thus enabled to absorb the vibration of the heaviest cut.

The sliding bed is accurately planed and fitted into the lower bed, and as the carriage and tailstock are moved along with it, perfect alignment with the head spindle is assured in all positions. The bed is moved by means of a coarse pitch screw and hand wheel at the rear of the lathe.

Write for catalogue of complete list of Lathes that are guaranteed to effect economy in your shop.

The Rahn-Larmon Co.
Cincinnati, Ohio, U.S.A.

HAVE YOU EVER SEEN A NO. 205?



No. 205. Double Circular Saw.
Patented Jan. 26, 1908.

If you did, you know it's the finest saw ever built for pattern shops.

There is so much to tell about this machine that we have gotten up a special booklet about it. You are entitled to a copy and it will be sent upon receipt of your name and address.

Built like a machine tool throughout, but in such large lots that the price is right.

Don't forget to write for the book.

J. A. FAY & EGAN CO., 362-382 W. FRONT STREET, CINCINNATI, - OHIO.

POWER PUNCHING AND SHEARING MACHINERY

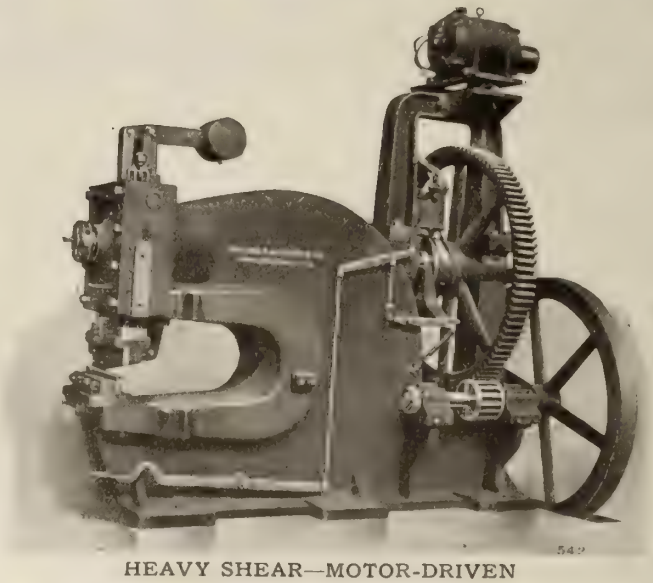
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications.



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

Tire Bending Rolls.

Bending and Forming Machines.

Drop and Helve Hammers, Etc., Etc.

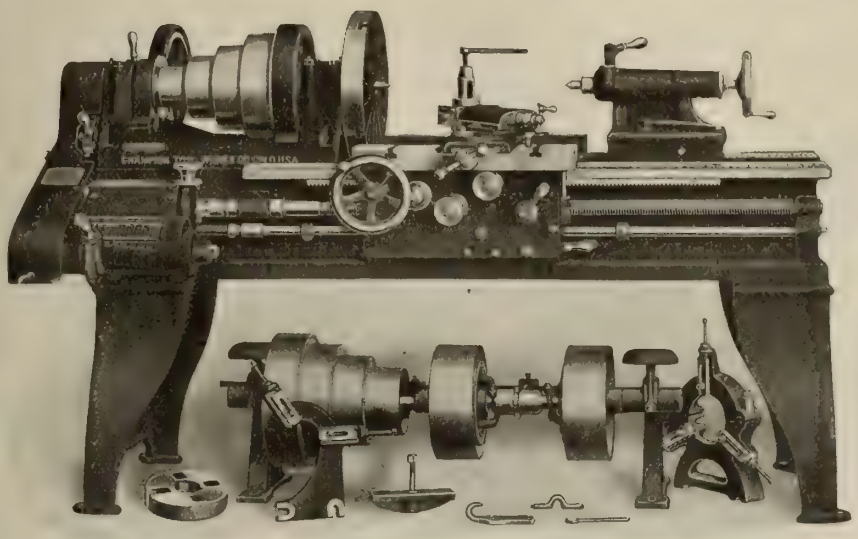
Designed and Manufactured by

THE LONG & ALLSTATTER CO.

Hamilton, Ohio, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

IF YOU'RE GOING TO ECONOMIZE You Must Use



16-in Quick Change Lathe.

THE
BEST TOOLS
AT THE
RIGHT PRICE

and ***Champion Lathes*** will give you more conveniences, greater accuracy, and lasting service than can be found anywhere for the money.

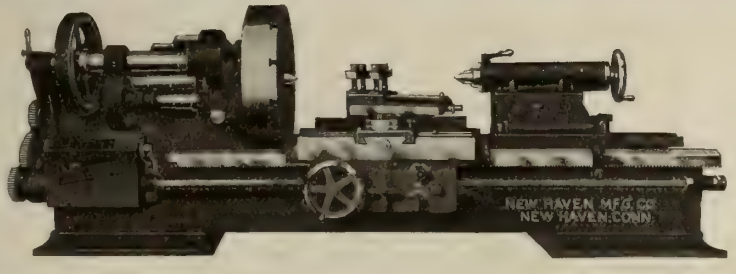
In addition to all gears being safely and completely guarded in the neatest and convenient manner, they have a range of Screw Cutting for right or left hand threads of 2 to 56 per inch, including 11½, with feeds 3½ times the threads, and all obtained through a Quick Change Box with the plainest, least complicated Index Plate for finding and changing instantly all combinations without the removal or reversing of a single gear.

This is only one feature, and you should consult our **Catalogue of 10, 12, 14, 16 and 18 inch Lathes,** with or without attachments, Quick Change or Standard Type for

THE BEST LATHE PRACTICE

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.



Feed Boxes of New Haven Lathes

Absolute Reliability!

On all Lathes not equipped with a quick change gear device (except 50 in. and 60 in.) we furnish our 3 or 4-change Feed Box, which gives us our feed changes instantly, and also reduces the number of gears necessary to cut the complete range of screw heads.

We have abandoned the ordinary sliding key drive, and use multiple tooth clutches, each tooth clutch having a driving power greater than that of a sliding key.

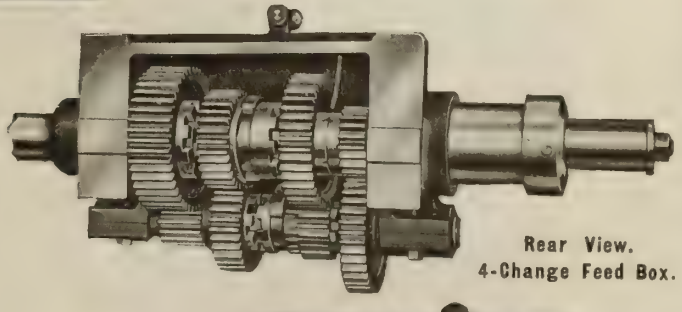
On the coarsest threads and feeds the head screw is clutched in directly, none of the gears in the box transmitting any power.

When any clutch is engaged the others are locked in a neutral position, and the lever is so proportioned that it operates easily even while the Lathe is taking a heavy cut.

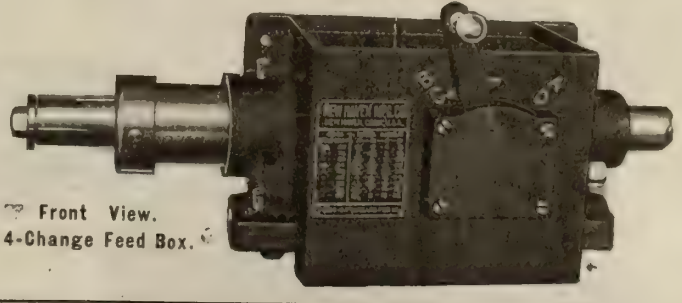
Write for our descriptive catalogue

New Haven Mfg. Company

NEW HAVEN, CONN., U.S.A.



Rear View.
4-Change Feed Box.



Front View.
4-Change Feed Box.

Bath No. 2 Universal Tool Room Grinder



EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

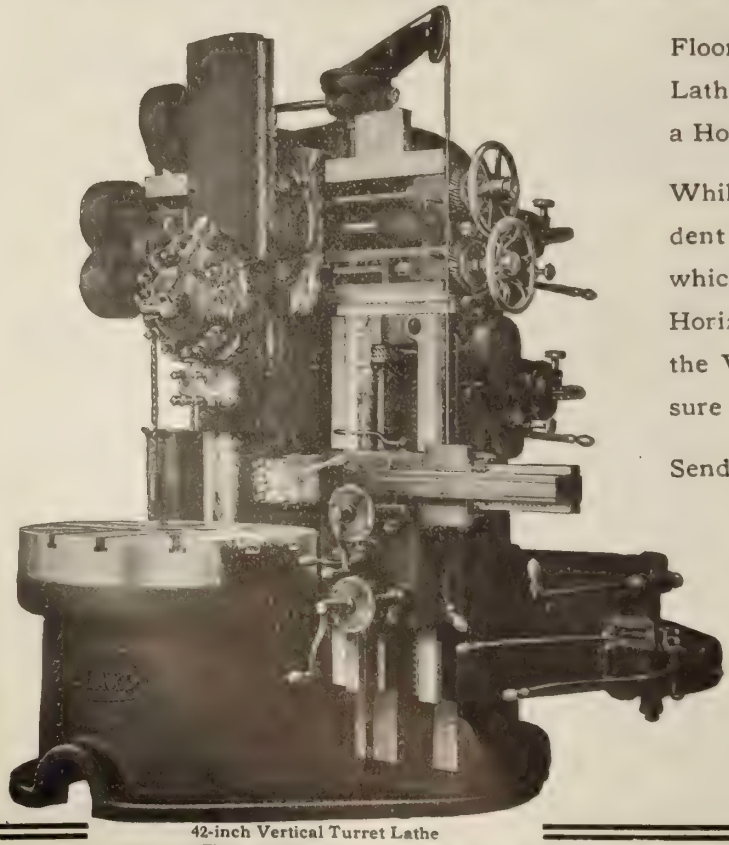
Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

SEND FOR CATALOGUE.

BATH GRINDER CO., Fitchburg, Mass.

YOU ALWAYS HAVE ROOM UP AND DOWN



42-inch Vertical Turret Lathe

Floor space is always limited. The Vertical Turret Lathe occupies only one-third of the floor space of a Horizontal Turret Lathe.

While this is an invaluable feature it is only incident to the design of the Vertical Turret Lathe which embodies all the desirable features of the Horizontal Turret Lathe combined with those of the Vertical Boring Mill in such a manner as to insure a maximum output with minimum effort

Send for Pamphlet C-42 illustrating this New Era tool and describing such distinctive features as Chrome Nickel Steel Gearing, Sight Feed Oiling, Micrometer Adjustment, etc.

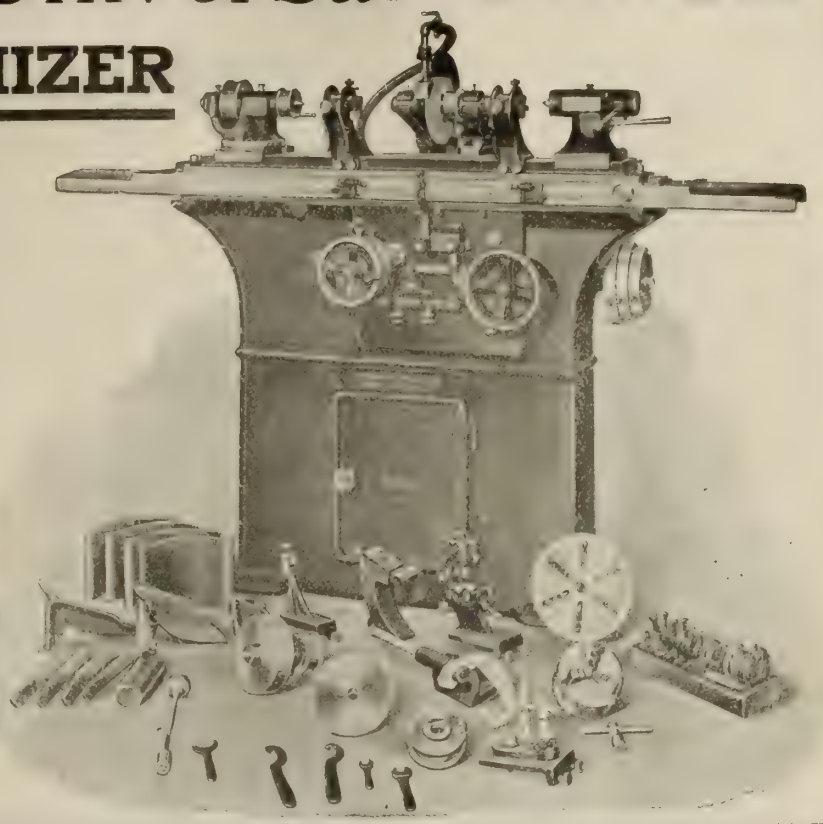
The Bullard Machine Tool Co.

BRIDGEPORT, CONN., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

"Modern" Universal Grinder

IS THE REAL ECONOMIZER



The difference between profit and loss often lies in the margin of small economies when you are turning out goods under close competition.

Proper and modern machinery is the one means of getting ahead of your competitor.

The "MODERN" UNIVERSAL GRINDER is more rigid, durable, and is better made than most grinders and produces more work and better work, with the same effort, than do its rivals; therefore its very high standing.

A special feature of the "MODERN" UNIVERSAL GRINDER is the **New Patented Table Hand Wheel Stop**, which stops Hand Wheel while table is in motion, thereby eliminating the shock from the quick reverse of the Hand Wheel.

Made in two sizes. The prices are right.

MODERN Tools are all guaranteed.

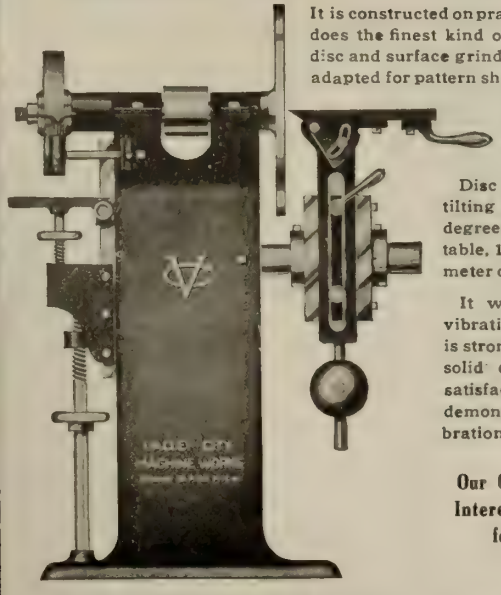
Write us before you buy elsewhere.

Modern Tool Co.

Erie, Pa., U.S.A.

No. 9 Disc and Surface Grinder

Here is the Machine That will Meet *Your* Requirements.



It is constructed on practical lines and does the finest kind of work. This disc and surface grinder is especially adapted for pattern shops, die makers and all kinds of tool and surface grinding.

Disc side has table tilting from 0 to 43 degrees Size of disc table, 10 x 10 in. Diameter of disc, 18 in.

It will solve your vibration problem. It is strongly built of one solid casting; and satisfactory tests have demonstrated that vibration is avoided.

Our Catalogue will Interest You. Write for it now.

Valley City Machine Works

20 Compau Street

GRAND RAPIDS MICHIGAN

BLOUNT'S

Grinding, Polishing and Buffing Machinery



Mr. Manufacturer, why not economise space in your shop by using one machine instead of three?

Here is a machine that does better work than separate ones and saves much space, time and labor.

It is the smoothest running machine on the market, is well finished, and perfectly designed, and is guaranteed to give reliable service.

Write also for information regarding our Speed Lathes and Wet Tool Grinder.

J. G. Blount Company

EVERETT, MASS., U.S.A.

We Guarantee

our *Model B Hi-Speed* to deliver the full efficiency of high speed drill up to one and one-quarter inches] in diameter—



ACTUAL SIZE OF CHIPS
$1\frac{3}{4}$" drill. 128 rpm. .015" feed. .40 carbon steel

This identical machine has driven a one and three-quarter high speed drill through a solid block of point forty carbon steel at the rate of one and nine-tenths inches per minute.

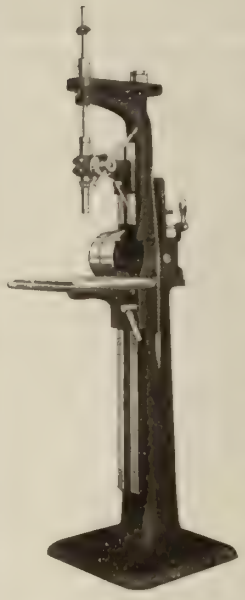
DO YOU THINK OUR GUARANTEE IS GOOD?

Sibley Machine Tool Company

Church Lane
South Bend, Ind., U.S.A.

Manufacturing Drilling Machines

OF HIGHEST EFFICIENCY



16 SIZES, 5 TYPES
FOR DRILLING HOLES ¾ INCH AND UNDER

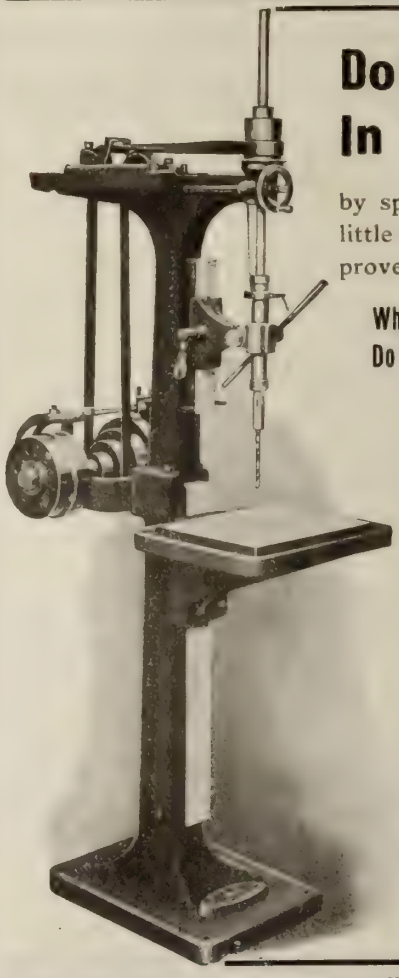
They have rigidity for heavy work and power to drive high speed steel drills to the limit of endurance.

Compact in shape, only the minimum floor space is required; silent chain and positive gear drive replace the usual belts; every operating convenience to save time and labor.

Write for latest Catalog—full line of Drilling Machines, Bench Lathes, Foot Presses, Special Machinery

THE TAYLOR & FENN COMPANY

HARTFORD, CONN., U S.A.



Dollars Saved In Labor

by spending comparatively little for a modern TOOL proves a good investment

Why Hire Three Men To Do One Man's Work?

THE AVEY
Ball Bearing Drilling Machines

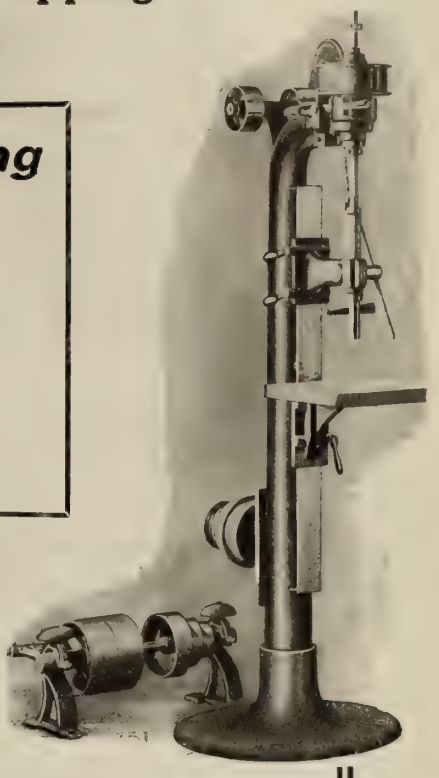
will make you new records of low costs.

Let us show you why and how.

Built in single and multiple spindles for No. 1, No. 2 and No. 3 Taper Drills—various overhangs.

THE
Cincinnati Pulley Machinery Co.
CINCINNATI

"Barr" Combined Drilling and Tapping Machine



Save Space, Labor and Handling

by installing "BARR" combined machines.

They do drilling and tapping as well as two separate machines, and are guaranteed to meet the requirements of any strictly up-to-date machine shops.

We can give you power feed, or lever feed, and tapers in any combination FROM TWO TO SEVEN SPINDLES TO A MACHINE.

Write for catalogue and particulars.

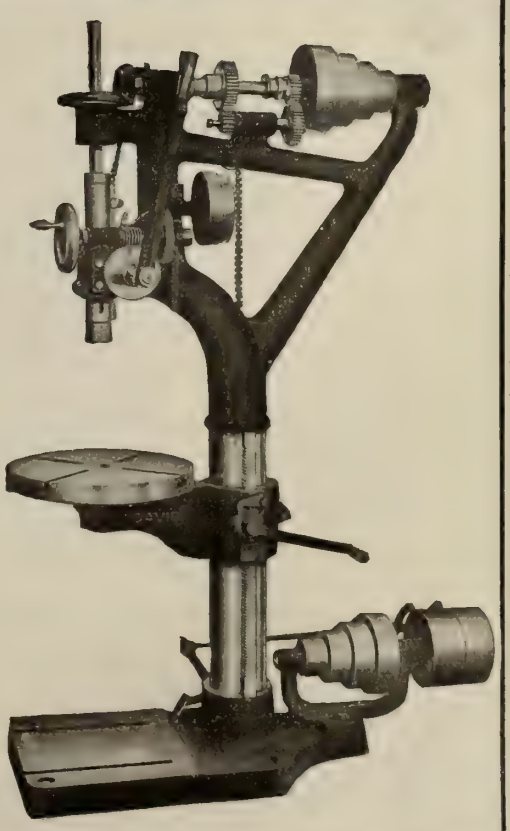
H. G. BARR, Worcester, Mass., U.S.A.

WILLIAMS & WILSON, Montreal—Agents for Eastern Canada

The General Supply Co., of Canada, Ltd.

OTTAWA TORONTO WINNIPEG

20-Inch "DAVIS" B.G. and P.F. DRILL



THIS MACHINE has back gears, hand and foot power feed, automatic stop, quick return, wheel and lever feed. Spindle is counter balanced.

The table has vertical adjustments on column by means of handle operating gear in rack. Shafts are made of steel.

Gears are cut two to one, and cone has four steps, 3 13/16 in. to 8 5/10 in. diameter.

The rigid construction of this drill assures perfect service and durability.

Write for catalog and prices.

The W. P. Davis Machine Company

Office, Salesroom and Factory, Rochester, N.Y., U.S.A.

MILLED PRODUCTS

FOR the Production of Milled Products we have built a complete Screw-making Plant at Montreal. This puts us in position to supply a very high grade of parts to the Canadian Manufacturers at a moderate cost. A complete stock of standard goods is carried and special parts are made accurately to customers' specifications.

Send for a Catalog on *Milled Products*

THE NATIONAL-ACME MANUFACTURING CO.

MONTREAL, QUE. St. Elizabeth & G.T.R.

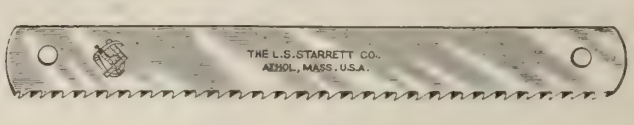
NEW YORK, 77 White St.: BOSTON, 141 Milk St.: CHICAGO, 549 Washington Bldg : DETROIT, 1222 Majestic Bldg.: ATLANTA, Candler Bldg

Factories:—CLEVELAND, MONTREAL. Warehouses:—NEW YORK, CHICAGO

RUSH WORK

It's the hardest kind. There's the strain on your nerves as well as your energy. Any little mishap seems much bigger than usual. Any error makes you mad.

Starrett Tools are accurate - they make no error—your confidence in them will give you belief in your results—you will work accurately and fast.



Starret Hack Saws cut quicker and last longer—just the saws to trust for rush work.

Send for Catalog 193, it's free. If your dealer does not have the tools you want we will send them direct to you.

THE L. S. STARRETT CO.

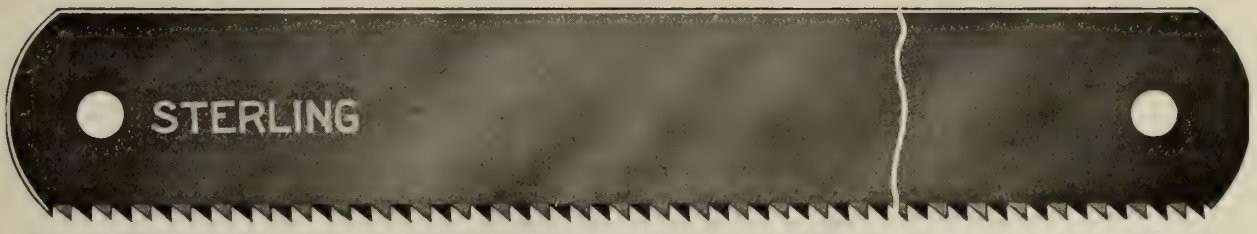
ATHOL, MASS., U.S.A.

NEW YORK
150 Chambers Street

CHICAGO
17 No. Jefferson St.

The advertiser would like to know where you saw his advertisement—tell him.

"STERLING" HACK SAWS



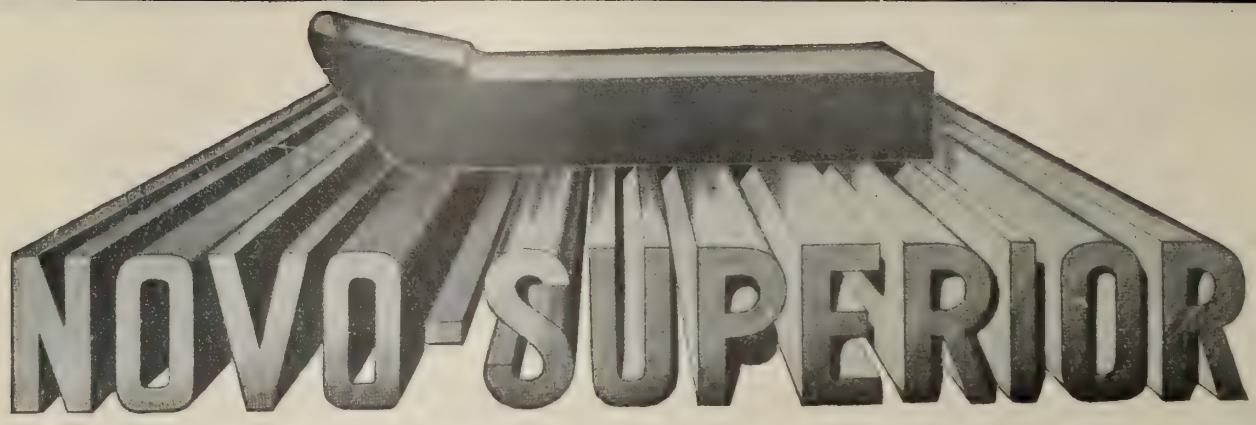


No. 2½ High Speed Power Hack Saw Machine.

The latest development in a metal-cutting saw, equipped with AUTOMATIC LIFT, ADJUSTABLE VISE which may also be swiveled to cut material at any angle up to and including 45 degrees. Saw frame can be adjusted so that blades from 10 to 15 inches inclusive may be used. Capacity of machine 7 inches.

MANUFACTURED BY

Diamond Saw & Stamping Works, Buffalo, N.Y.



High Speed Steel Has a Solid Foundation In a Name That Means Something

Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND MONVINCE YOURSELF

HERMANN BOKER & COMPANY
332 ST. JAMES ST., MONTREAL

FIRTH'S TOOL STEELS ARE THE BEST

Firth's EXTRA Tool Steel
Firth's BEST Tool Steel

We carry in our Montreal warehouse a large stock of these well-known brands in Rounds, Squares, Octagons and Flats. Annealed and Un-annealed. All standard sizes in suitable tempers for all purposes.

THOS. FIRTH & SONS, Limited
Norfolk Works: SHEFFIELD, England
Canadian Warehouse: 507 St. Paul Street, Montreal
J. A. SHERWOOD, Agent

"Conqueror" Brand Profile Tool Steel

Make your own high speed twist drills, cut out the long waits and save 50% to 75% on your costs.

No Forging Required



Easily Ground

A Fluted — B Vee — C Star — D Three Wing — E Bolt Head — F Scraper — G Parting — H Twist Fluted

A FLUTED, to be used for parting and roughing tools.
B VEE, to be used for parting tools and tool holders.
C STAR, or Four Lip, is indispensable for making the following tools quickly and economically, viz.:—Chisels, Chucking or Four-Lip Drills, Counterbores, Rose Bits, End Mills, Reamers, Taps, Profiling Tools, Milling Cutters, Valve Seating Tools, and many others.
D THREE WING, wil be found of great advantage in making Reamers for cleaning out cored holes in pulleys, gear blanks, etc. As this shape produces tools bearing on three cutting edges, it perfectly roundens holes cored oval. This profile will also make fine finishing and sizing reamers.
F SCRAPER, a most valuable and handy addition to any machine shop; it will make the Scraper Tool by simply grinding into shape; will also make Three-Lip Drills, countersinks, and many other kinds of tools.
G PARTING, this will make a Parting or Cutting-off tool in almost no time, merely by cutting a piece of the bar and inserting in tool holder.
H STRAIGHT FLUTED, to be used in making Drills for Shadow-drilling or for High Speel Drills to be made at short notice. **TWIST FLUTED**, to be used in making Twist Drills. They are rolled hot to the same shape as Milled Drills and are not merely flat bars twisted, such as are sold in the market to-day under the name of **FLAT TWISTED DRILLS**. These Flat Twisted Drills, while being quite durable, cannot produce such straight and accurate bores as the drills made from our Profiles, since the latter afford a much wider bearing surface on circumference of drill, guiding the same absolutely true. **OUR PROFILES MAKE TWIST DRILLS AS ACCURATE AS MILLED DRILLS.** This refers particularly to drilling deep holes where the difference between flat twisted and our profiles becomes very noticeable.

Profiles are made fron ½ inch to 3 inch diameter running in 1-16 inch, both straight and twist fluted. Twisted Bars are made in lengths of about five feet, straight bars somewhat longer.

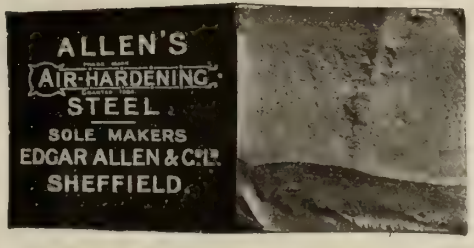
ALEXANDER GIBB, 13 St. John Street, Montreal

Edgar Allen TRADE AIR-HARDENING MARK High Speed Steel

FOR TOOL HOLDERS

Cut to Standard Lengths and hardened ready to be ground

Packed in 10 pound boxes, one size or assorted sizes.



PRICE: - $10.00 per box Montreal and Toronto

Sizes carried in Stock, cut to Standard Lengths and Ready Hardened

Square	Flat	Bevel
3/16 x 2 1/2" long	3/8 x 1/4 x 2 3/4 long	5/8 x 1/16 x 3/32 x 5 1/2" long
1/4 x 2 1/2" "	7/16 x 5/16 x 3 1/4 "	3/4 x 1/8 x 3/32 x 6 1/2" "
5/16 x 2 1/2" "	1/2 x 3/8 x 3 1/2 "	7/8 x 1/8 x 3/32 x 7 1/2" "
3/8 x 3 " "	3/4 x 1/2 x 4 1/2 "	1 x 1/8 x 3/16 x 8 1/2" "
7/16 x 3 1/2" "		
1/2 x 4 " "		
5/8 x 4 1/2" "		
3/4 x 5 " "		

THOMAS HAMPTON

MANAGER FOR CANADA

330 St. James St., - - - MONTREAL

Millions of Feet
of
Seamless Steel Tube

SHIPPED FROM OUR MILLS EACH YEAR

This demand has been created by manufacturers requiring a high-class mechanical tubing, containing a reasonable percentage of carbon, capable of good finish and ready manipulation, at an economical price. Some of the articles being manufactured to advantage with our tube are:

ADDING MACHINES
AEROPLANES
AGRICULTURAL MACHINERY
AMMUNITION HOLDERS
AXLES
BABY CARRIAGES
BEDSTEADS
BICYCLE PARTS
BOILER COILS
CANES
CREAM SEPARATORS
DIE STOCK HANDLES
DISPLAY FRAMES
ELEVATOR CAGES
EXHAUST TUBES
FIREARMS
GAS FIXTURES
GO-CARTS
HAND RAILINGS
HOSE MANDRELS
LAMP BRACKETS
LAWN MOWERS
MAGAZINE TUBES
METAL FURNITURE
MOTORCYCLE PARTS
OPERATING TABLES
ORNAMENTAL OFFICE FURNITURE
PNEUMATIC TOOLS
PUMPS
RATCHET DRILLS
SANITARY FURNITURE
SCREW PLATE HANDLES
SHOVEL TANGS
STEERING LEVERS
STEERING POSTS
STEERING WHEELS
STOVE GUARD RAILS
SURGICAL INSTRUMENTS
SWORD SCABBARDS
TELEPHONE DESK STANDS
VACUUM CLEANER HANDLES
WHEEL BRACES

Accuracy to Diameter and Gauge is Assured.

The Standard Welding Co.

Electric Welding Pioneers

CLEVELAND

REPRESENTATIVES

CHICAGO DETROIT NEW YORK

OXYGEN

Of guaranteed purity by the Claude's Process. The largest and most up-to-date plant now in operation on this continent.

OXYACETYLENE

AND ALL SYSTEMS OF

WELDING and CUTTING PLANTS

For welding steel, cast iron, copper, brass, lead, aluminum. For cutting steel and wrought iron.

SAMPLE AND REPAIR WORK UNDERTAKEN

R. J. LEVY

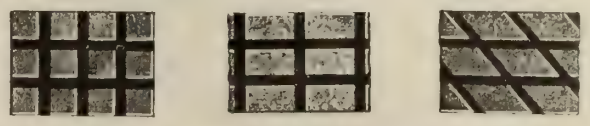
MANUFACTURER OF OXYGEN

MAISONNEUVE - MONTREAL

Telephone East 6713

LAFFITTE

Tho New French Brazing Compound



No. 1 For Brazing Brass, Red Copper & Bronze

No. 2 For Brazing Red Copper and Iron

No. 3 For Brazing Iron and Steel

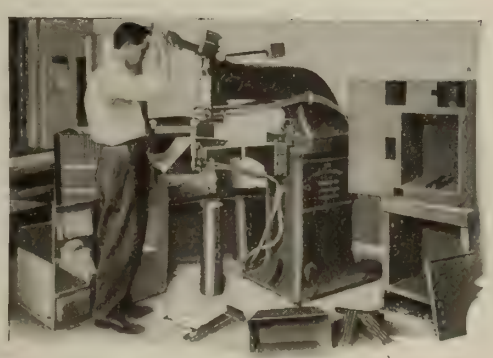
These three contain all the necessary ingredients for a perfect braze, including a great proportion of copper solder.
As they melt at different heats it enables the brazier to have a solder which fuses at a lower heat than the metal being brazed.
Does quicker, cleaner, better work. No swelling or blistering.
Leaves braze free from oxides and residue ready to finish.

SAMPLES FREE on request.

Complete stock of Laffitte Products carried by active dealers throughout Canada

THE PHILLIPS-LAFFITTE COMPANY

801 Penna. Bldg., Philadelphia, Pa., U.S.A.



STOVE WELDER.
Lever Handle, Swiveled or Stationary, as Preferred.

Total height, 60 inches. Length of horn, 25 inches.
Floor space. 24 x 31 inches. Depth of throat, 30 inches.
Power required for welding stock up to and including . . . { 16 gauge, 15 k. w. or 20 h. p. / 10-gauge, 20 k. w. or 27 h. p.

Cancel that Order for Rivets.

Discard your Riveting Machine.

Get a "Rivetless Riveting Machine" that will do 75% more work in the same time at a much less cost.

If you're making Sheet Metal Boxes, Cans, Stoves, Wire Racks, or in fact anything of sheet metal or wire that overlaps, the job will be Better, Stronger, Quicker, More Economical, if you do it with a Toledo Electric Spot Welder,

No Holes to Punch---No Rivets Used.
Clean :: :: :: :: Noiseless

It's The Electric Way.

TO OPERATE Place two pieces of sheet steel between the copper die points---press your thumb on the lever (this closes switch)---let go; and the job is done. Finished so quickly you can't catch the time with a stop watch. But we can't tell all about it here.

A POSTAL REQUEST WILL BRING OUR CATALOG.

A "Spot Welder" Will Save You Real Money---Better Investigate.

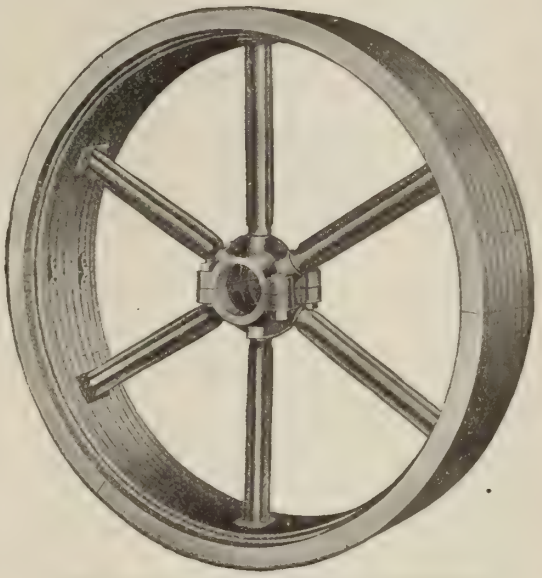
NO LEASE :: NO LICENSE :: NO ROYALTY.

Protection Guaranteed against Patent Suits

The Toledo Electric Welder Company

CUMMINSVILLE - - - - - CINCINNATI, OHIO.

GOING SOME



Manufactured in Commercial Sizes all the way from 12 x 3 up to 120 x 48.

"That's certainly going some," a gentleman said when we told him about the 76x20 POSITIVE Combination Split Wood Rim Steel Center Pulley we have running in a mill at 8,300 feet per minute rim speed.

Well, we admit that it's traveling right smart. In fact, we don't like to put a pulley out to roll around so merrily. Yet this selfsame pulley has now been whirling at this gait for over eight months without a whimper.

A POSITIVE Pulley of the size mentioned weighs 530 lbs., against 3,960 lbs. for an iron pulley. That's why the POSITIVE Pulley stands the tremendous centrifugal force, which would burst the iron pulley. We emphasize that we combine *maximum strength and lightness.*

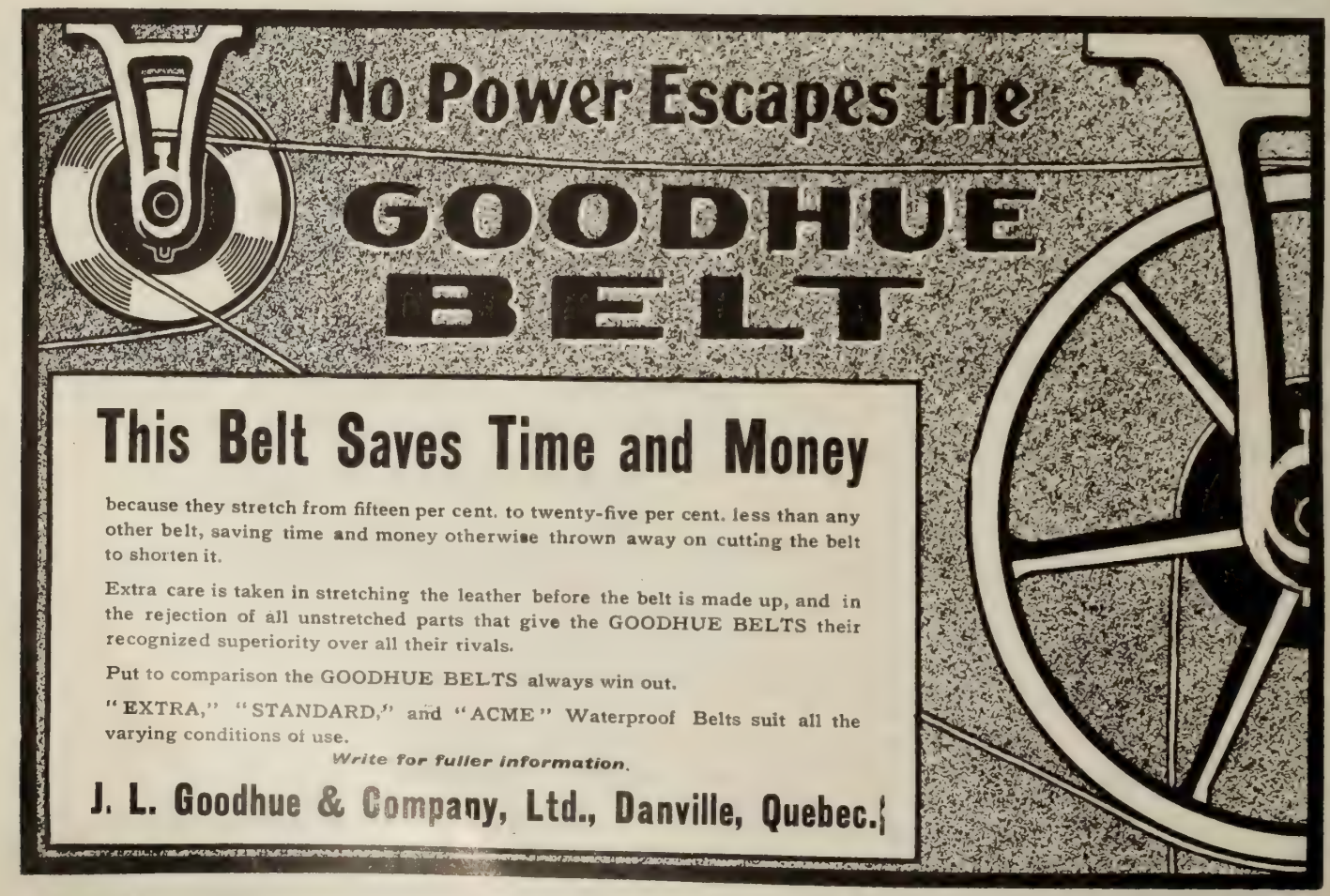
Bear this fact in mind. Some day you will be in the market. Then when you look over pulleys of every make, you will come to the conclusion that after all the best pulley for you is the POSITIVE Pulley, the pulley that "whirls without a whimper," because it is just so much higher grade than all the rest—the pulley that is "going some."

The Positive Clutch & Pulley Works, Limited

Eastern Warehouse: CANADA FORD CO., Montreal, P.Q.

American Works: Buffalo, N.Y.

11-13 Jarvis Street, TORONTO, ONT.



The advertiser would like to know where you saw his advertisement—tell him.

"IT IS RIGHT"
"WHEN WORKED RIGHT"



What a wonderful exemplification of above statement is given in the following letter :

GEORGE A. DIEMER,

Artistic and Ornamental Metal Work Made, Polished, Oxidized and Lacquered.

Magnolia Metal Co.,
113-115 Bank Street, New York, N.Y.

298 First Street, Newburgh, N.Y.,
Feb. 21, 1911.

Dear Sirs :

In reply to your letter of the 16th inst., I will say that I have used a small amount of your metal. It will be sixteen years, this coming July, that I used it on a high speed lathe (running 3500 R.P.M.) also on the countershaft hangings, **and it is there to-day**, in A No. 1 condition. There is another small shaft in the shops, a head shaft for a motor drive, which **has run much longer, and has not had a drop of oil or a speck of grease on it in at least six years,** to my personal knowledge (as I have always attended to this part myself) and it runs that freely, that even I am in doubt sometimes myself, but am willing to show it to any of your agents that care to see it.

The above will explain why I have not used much. It is right, and works right, when worked right.

Sincerely yours,
GEORGE A. DIEMER.



Special Offer

PRACTICAL ENGINEER POCKET BOOK, 680 pages, over 2,000 subjects. We do not aim to make a profit on this book, as it is an advertisement, therefore offer it at the very low price of 40c., postpaid. Many Engineers pronounce it invaluable. Address Montreal office.

Sold by Leading Dealers Everywhere or by

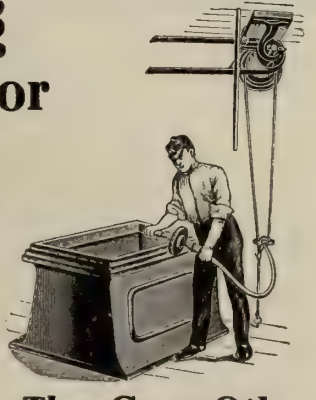
Magnolia Metal Co.

225 St Ambroise Street - MONTREAL
NEW YORK CHICAGO

Gem Shafting Lightens Labor

It enables you to take the tool to the work, instead of carting the work to the tool. Our Portable Emery Grinder is a high class general utility tool of wide range. It is *useful, practical* and *convenient.*

Write for catalog and remember—the *Gem guarantee is binding.*



GEM GUARANTEE GOOD

The Gem Oiler
is an economical oiler



It has a patent cleaning device that saves time and oil. It is exceptionally strong, machine made and interchangeable in all parts. Its durability is guaranteed. Made for all purposes.

Send for Gem Catalog

Gem Manufacturing Co.
3257 Spruce Street
Pittsburg, Pa. U.S.A.

English Agents—A. A. Jones, Pollard & Shipman Co., Ltd., Church Gate, Leicester, England.

The Noon Hose Coupler

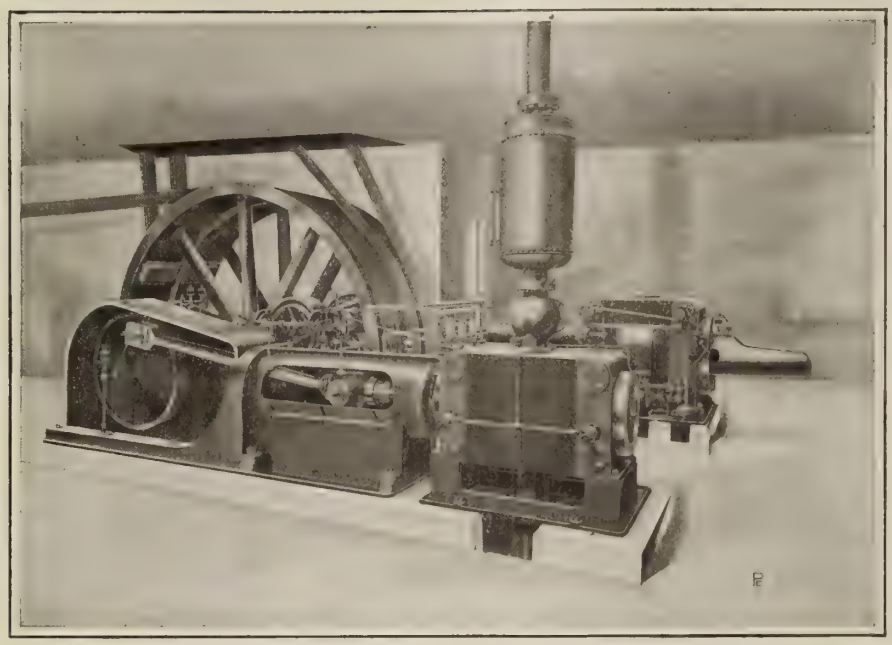
This is the only outside Coupler on the market. The advantages of an outside coupler are self-evident.

IT never blows out.
IT never freezes up.
IT never leaks.
IT saves the hose.
IT saves your compressor.
IT saves your fuel
IT saves the time of the operators.
IT needs no gaskets or washers.
IT can be adjusted and altered in one-tenth of the time another coupler can.

IT gives you the full capacity of your hose—so much so that a line of HALF INCH hose equipped with the NOON COUPLER will give practically as much power as a THREE-QUARTER inch hose equipped with any other coupler.
ITS saving qualities enable the coupler to pay for itself in a short time and will save you money from the first day you use it. WRITE FOR PRICES.



THE NOON UNIVERSAL COUPLER CO.
LIMITED
Room 603, Kent Bldg., TORONTO, ONT.



Cross Compound Goldie Corliss at Cosmos Cotton Co., Yarmouth, N.S. Rope Drive.

Reliability is the most important consideration in the selection of a Power Plant.

Manufacturers above everything else must have a steady day in and day out service.

The only way this can be obtained is by the installation of a HIGH GRADE STEAM ENGINE.

Goldie Corliss Steam Engines give a maximum of service all of the time.

Remember your **Exhaust Steam** does away with

HEATING BILLS

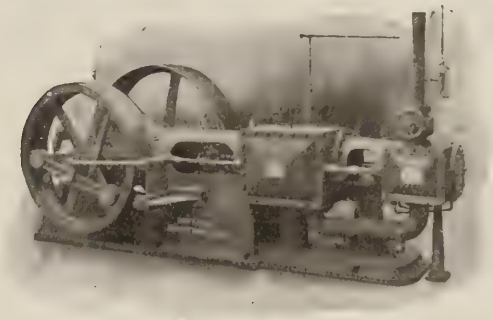
Ask for our Catalog and all Particulars

The Goldie & McCulloch Co., Limited

GALT, - - ONTARIO, - - CANADA.

WESTERN BRANCH
248 McDermott Ave., Winnipeg, Man.
MARITIME PROVINCES
13-15 Dock St., St. John, N.B.

QUEBEC AGENTS
Ross & Greig, 412 St. James St., Montreal, Que.
B. C. SELLING AGENTS
Robt. Hamilton & Co., Vancouver, B.C.



McEWEN
HIGH-SPEED AUTOMATIC
ENGINES

Are built essentially for the economical production of electric light and power. Directly connected to dynamo, they cannot be equalled for smoothness of running, absolute reliability, and for capacity to absorb overload without flinching. They are built in simple and compound units up to 700 H. P.

The McEWEN ENGINE CATALOG WILL BE SENT ON REQUEST

The Waterous Engine Works Co.
LIMITED
BRANTFORD, CANADA

Specifications.

ALL parts are few and simple and are built to template, so that repairs can be quickly furnished. The bed is heavy and rigid, combining great strength with accessibility for all adjustments. Crosshead guides, main bearings, and face for cylinder attachment are machined in one operation. Connecting rod, of marine type, is slotted from the solid forging. Cylinder casting, of the best close-grained iron, is thick enough to permit re-boring, and has front head cast solid. The flat side valve, double ported and frictionless, is held in place by a balancing pressure plate, slotted to correspond with the valve seat. This produces additional passage to the cylinder by providing double admission and exhaust edges. Relief valves are absolutely unnecessary. Crosshead shoes have a special eccentric bolt adjustment, which is simple, rapid, and perfectly accurate. The special feature of these engines is the guaranteed control by the Begthrup Governor. This, the first successful shaft governor built, permits instantaneous regulation without flinch when changing from full load to no load.

GUARANTEE

The engine shall not run one revolution slower when fully loaded than when running empty, and a reduction of boiler pressure from the greatest to that necessary to do the work, will not reduce the speed of the engine one revolution. Any engine failing to meet this guarantee becomes the property of the purchaser upon the payment of one dollar.

The advertiser would like to know where you saw his advertisement—tell him.

BUILDERS OF

Derrick and Overhead Travelling Cranes

Engineers, Boilermakers

AND

Structural Steel Fabricators and Erectors

BOILERS OF ALL TYPES --- LAND AND MARINE

CONTRACTORS FOR

Water Towers, Stand Pipes, Penstocks, Draft Tubes, Oil Tanks, Roofs, Bridges, Columns and Girders.

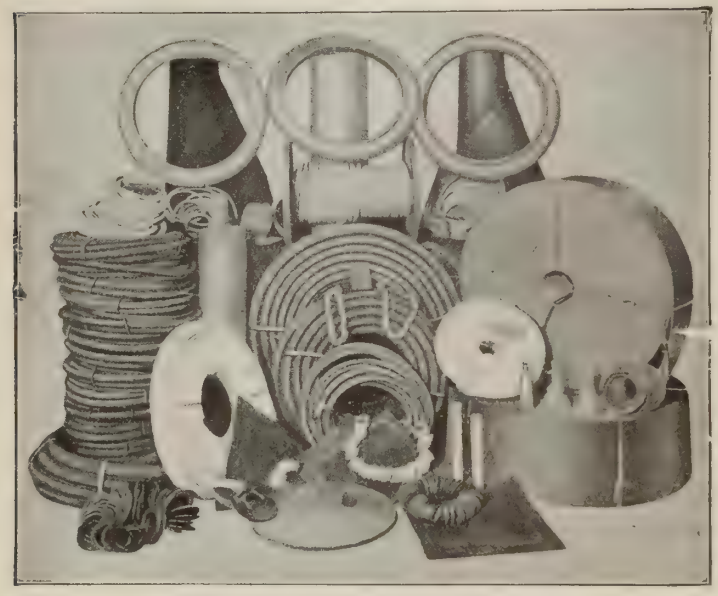
A LARGE ASSORTMENT OF STRUCTURAL SHAPES CARRIED IN STOCK FOR CUSTOMER'S CONVENIENCE

Our Shops, 1000 feet in length, are equipped with the most modern and up-to-date machinery for handling large contracts with dispatch, and our designing, inspection and testing staffs, are composed of men of wide and specialized experience.

International Marine Signal Company, Limited

OTTAWA, ONTARIO.

Use Goodyear Non-Chip, Rot-Proof Hose



A Few of the Lines We Manufacture

Don't tie up money in hose that begins to need repairs after a ***few weeks'*** use.

Buy the only dependable, never-mend hose—

GOODYEAR Water Hose

Built by World's Greatest Hose Experts for Pulp and Paper Mills, Manufacturers, Boiler Rooms, Flushing and Garden Use and All Uses Where Cold Water is Carried

The strongest, longest lasting hose made.

Goodyear hose is built on principles that years of experience have proved most practical. The fabric is cut on right bias to give greatest strength and endurance and to resist expansion and elongation—one of the prevailing faults of the common hose.

Only highest grade material used. Rot-proof, because specially treated and covered with heavy, durable canvas that can't chip off and expose tube to weather.

Can be furnished with round, half-round or flat wire winding or Marlin wind.

Steam Hose—Air Hose—Suction Hose

We manufacture highest grade hose for every purpose. Used throughout the Dominion. Wherever used, is ***saving money.***

All Goodyear products built according to same methods employed by Goodyear Tire & Rubber Co., Akron, Ohio—one of the best known and most successful rubber goods manufacturers in the United States.

Tell us your requirements. Let us send catalog. Write to-day.

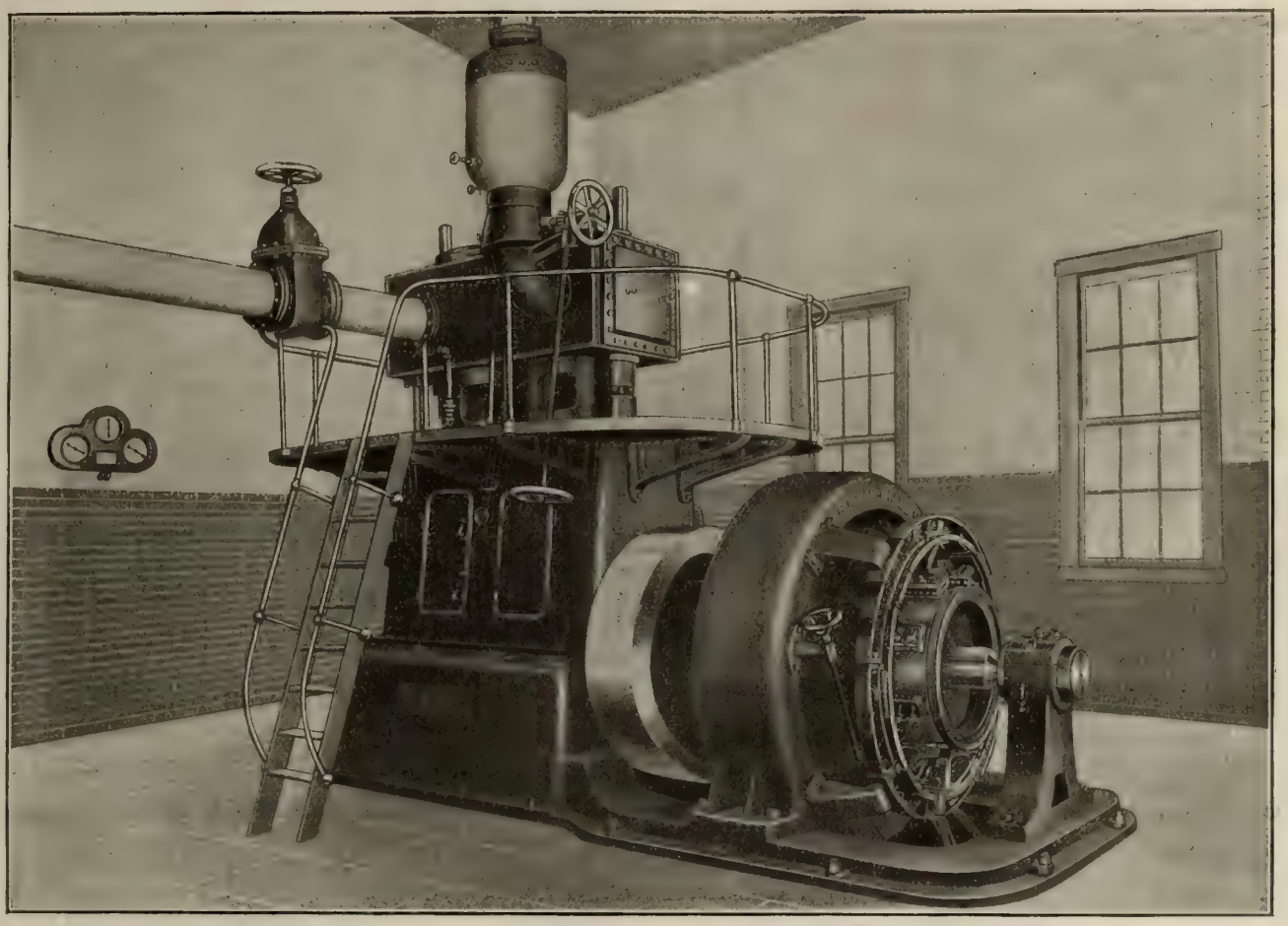
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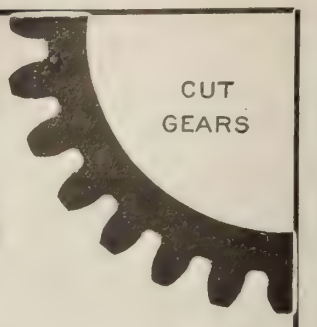
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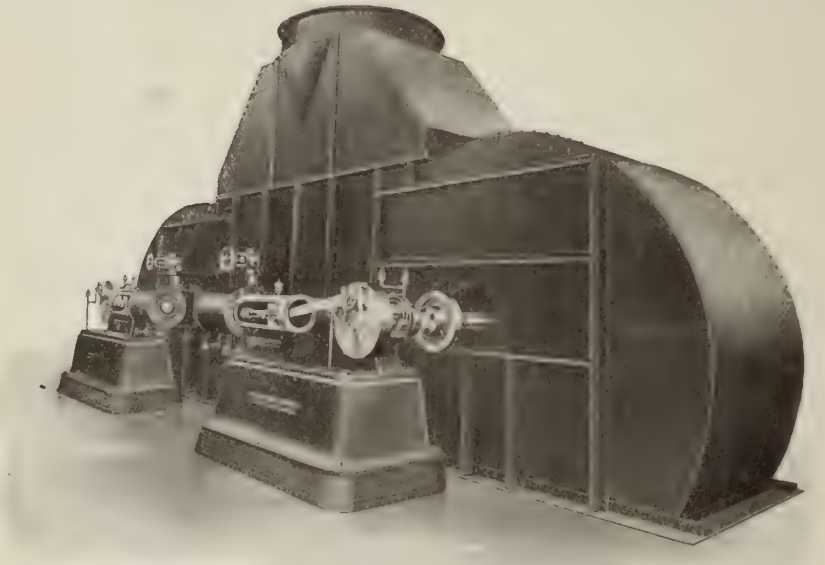
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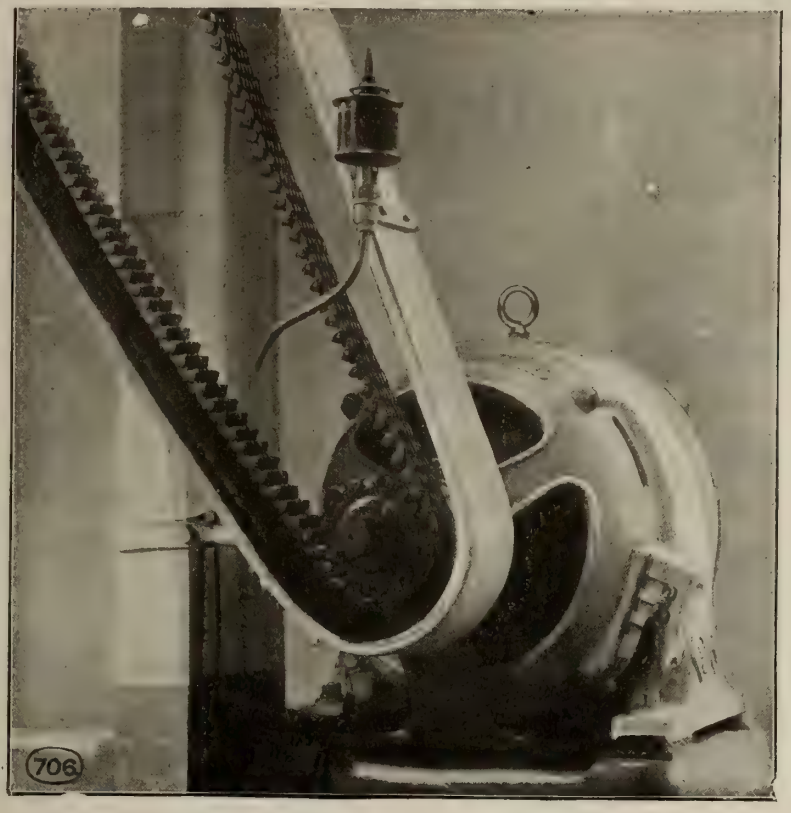
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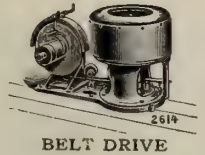
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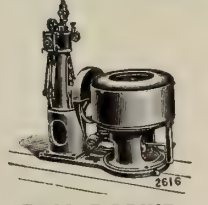
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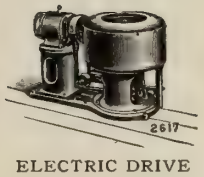
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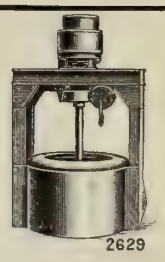
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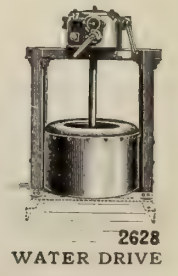
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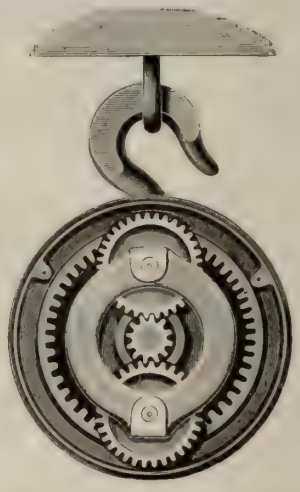
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By Halyard

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THE International Marine Signal Co. plant is located in Ottawa, the Capital City of the Dominion of Canada. It forms one of a number of large industrial enterprises found there, and known for their excellence of products throughout the civilized world.

Establishment of the Works.

Consequent to the discovery of commercial acetylene by Thomas L. Willson, of Ottawa, in 1892, and his successful adaptation of it to the lighting of gas buoys, the new design of which was another masterpiece evolved from the same fertile brain, works were established in the year 1907, to satisfy a world-wide demand for this new development in aids to navigation.

The success attained in the preliminary experimental and testing work was such as to insure for those concerned powerful financial support. The buildings and equipment were therefore designed and arranged to undertake all orders economically, efficiently and expeditiously. The officers and staff were selected from among those whose record showed them to be thoroughly qualified for the work of their particular department, and the wisdom of the various choices made has been amply demonstrated in the progress shown and extension of field now operated.

Fig. 1 gives a general idea of the main works building. Its total length is rather over 1,000 ft., thereby, affording one an opportunity, to comprehend the capacity available for manufacturing purposes. Railroad facilities are large, as may also be gathered from the same picture, there being no less than four companies concerned in the provision of siding service. These consist of the C.P.R., G.T.R., Ottawa Northern, Pontiac and Pacific.

Works Equipment.

Fig. 2 is an interior view of the works building, and shows various buoy bodies being assembled toward completion. Two 25 ton electric traveling cranes operate throughout the entire length of the centre bay. One 10 ton electric traveler takes care of each side, supplemented by a 5 ton hand crane. A railroad track through the centre bay, with switches to the main lines already referred to, permits loading and unloading to be done under cover and independent of weather conditions.

Fig. 3 is a picture of part of the machine shop, which contains an installation of the most modern and up-to-date tools. The equipment of punches, shears, drills and riveters, used in the fabrication of buoy bodies, tanks, water towers boilers and general structural engineering, is also the latest word in that line.

Referring again to fig. 2, it will be noted in the matter of daylight provision, that ample supply, from a good arrangement of side wall windows and roof skylights, is secured. Further, and concerning artificial light, a well laid out system of arc and incandescent lamps gives satisfactory working facilities.

Acetylene Gas Buoys.

It is advisable at this point, to say something concerning the automatic low pressure acetylene gas buoys and bea-



Fig. 1—View of main works building.

cons manufactured by the company. In the interests of humanity and commerce, every maritime nation, and every other nation having a coast line, has recognised it to be their paramount duty to provide the best possible aids to navigation.

These are of two principal kinds, first—those located on shore, and second—those afloat. Of the two, the latter is to our mind of most importance. Floating aids are usually placed outside of, or between the vessel and the danger to be avoided. Shore aids on the other hand are usually behind the danger, therefore the latter comes between the vessel and the provision for prevention.

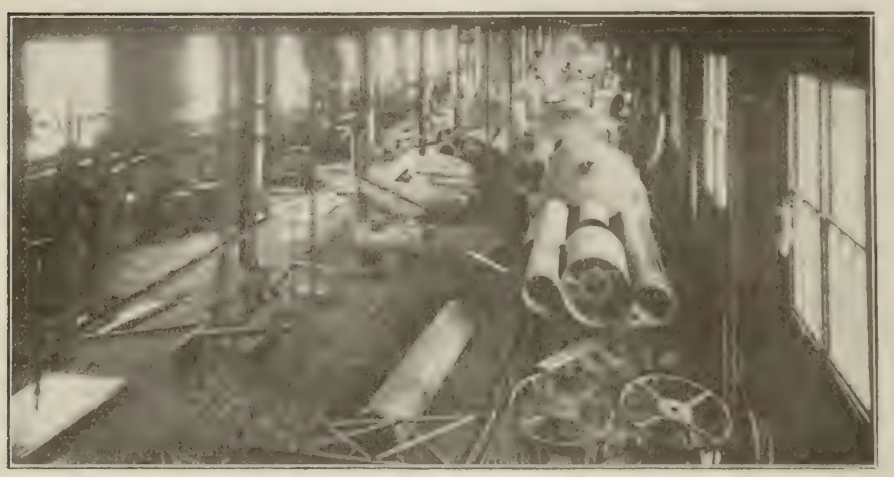


Fig. 2—Interior view of section of works.

Apart from lightships, floating signals are of two classes, first—lighted buoys; second—bell and whistling buoys. Previous to the introduction of acetylene gas, the most practical system, and that most generally used, was the storage of high pressure oil-gas in welded steel buoys. The manufacture of this gas, took place on shore in the usual way. It was then compressed into heavy steel holders under high pressure. These holders, some 4 feet diameter by 30 feet long, were then transported to each location, and the gas pumped into each buoy at a pressure of 150 lbs. per sq. inch.

Buoys lit by acetylene gas find favor with mariners, because the light is not only from 30 to 100 times stronger, according to the size of lantern, but also for the reason that its sharp penetrating effect, as compared with the oil gas-lit buoy, enables them to discern more certainly their location in thick, heavy weather.

Explanation of Acetylene Lighting System.

The lighting medium, as already stated, is acetylene gas, from which all impurities have been removed, by the use of a special purifier made for the purpose by the company. The buoys are automatic in operation, and generate their own gas under low pressure, with one full charge of calcium carbide. This latter varies in amount according to the size of the buoy, and gives a continuous light without diminution of power, throughout a period of six to nine months, without attendance.

The lantern, of best buoy type, is equipped with a Fresnel lens, which condenses the light into an intensely powerful and penetrating horizontal beam. Acetylene gas, as generally recognized, gives greater candle power per cubic foot than any other gas, at the same time the precise degree of increased strength is not perhaps too well known. Proven facts go to show that it is seven times greater in candle power than oil gas in compression, as used in the oil-gas type buoy. In addition to superiority of light over the latter, there is in addition provided a much larger supply.

The charging and recharging of buoys are simple and safe operations, easily understood, and capable of being performed in a comparatively short space of time. The system further obviates the necessity for and expense of generation, compression and storage, which form necessary adjuncts to the compressed oil-gas systems. Calcium carbide, from which the acetylene gas is generated, is contained in sealed tins, for easy transportation to each buoy location.

Explosion dangers have been practically eliminated, as the gas pressure is only a few pounds per square inch, being under any circumstance, not more than the pressure of water at the bottom of the buoy generator tube, say 6 pounds per square inch. The generator tube is constructed of heavy steel plate and steel castings, thereby making the low pressure carried absolutely safe. By dipping the calcium carbide in coal oil when charging the buoy, the possibility of even a slight explosion due to moisture affecting the carbide is entirely avoided.

Inasmuch as the buoys generate their own gas, they are independent of a convenient base of supply, an important consideration, which permits of very isolated location, if need be. There are no moving parts to the buoy, hence the absence of risk of its getting out of order, and the freedom with which it can be left unattended for long periods.



Fig. 3—Interior view of section of machine shop.

Production of Acetylene Gas.

Acetylene gas is produced by three methods. First—By bringing water into contact with carbide. Second—By dropping carbide into water. Third—By evaporation, without the water being in contact with the carbide.

For buoy lighting, the evaporation method was discarded, because considered unreliable for long periods of service in isolated positions, while the carbide to water method was decided against, on the ground that moving parts, liable to disorder, would be required. The system adopted was that of a modification of the water-to-carbide principle, and experience goes to show the wisdom of the choice, in efficiency results.



Fig. 4—Interior view of drawing office.

On land, for house lighting, railway lighting and other purposes, acetylene is sometimes used in a state of high compression. There are two different methods. One is naked acetylene compressed, and the other, acetylene compressed in the presence of acetone. Careful attention was given both these methods; but as they appeared to have very objectionable features, it was deemed unwise to adopt them for buoy or beacon use. Acetylene, while being compressed and in the compressed state, is highly dangerous; proof of this is found in the number of serious explosions involving loss of life and danger to property.

The purifier used ensures absolutely pure gas, and obviates clogging or carbonization of burners.

Types of Buoy, Construction and Operation.

Among the various buoys, beacons, etc., manufactured, are to be found the following leading types.—The combination lighted and whistling buoy, the combination lighted and whistling buoy with overhead or air bell, the automatic beacon, and the automatic beacon with explosive fog signal bell and whistle.

Combination Lighted and Whistling Buoy—The whistling device, an added feature of this type buoy, is an improvement of the well-known "Courtenay" principle. The construction and operation may be described as follows :—The float chamber of the buoy is fitted with two large air compressing tubes, open at the bottom and sufficiently long, to extend to the comparatively still water underneath the waves. The upper end of the tubes is closed, and each of the said ends is connected to a valve casing, on the top of which, a large and powerful whistle is bolted. In absolutely still water, the level of the water inside the tubes, is the same as the level of the water outside the float chamber. When the buoy rises on a wave, the air space above the water in the tubes is increased, in a ratio corresponding to the height the buoy rises, and air is drawn in through the ball check valves in the valve casing, to fill the increased space. When the buoy descends on the wave, this air is expelled through the whistle, giving a powerful blast. The amount of air available for blowing the whistle in this type of buoy is determined by the horizontal area of the compressing tubes. In the combination buoy, the area is 7 sq. ft.

This buoy is of massive and heavy construction and may be equipped with the largest sized lanterns—375 m.m. or 500 m.m. The combination of light and whistle, each of great power, constitutes a floating aid to navigation comparable only with lightships.

Lighted Buoy with Overhead or Air Bell.—In this type, the ordinary lighted buoy is equipped with an overhead bell, fixed within the lantern support. The bell is sounded by an arrangement of 4 rolling balls, running in bronze cylinders and impinging on steel strikers, adjusted at proper distance from the bell. The strikers are held in position by corrugated diaphragms bolted to the openings of the cylinders, which keep the latter water-tight, and the balls always effective. This system is adopted in locations where ice is liable to form, and is modified under other conditions, by having an overhead bell struck on its outer rim, through the medium of 4 arms, operated also by the action of the buoy in the water.

Automatic Beacons.—Beacons for locations on river banks, sea shores, isolated rocks, etc., are automatically operated by acetylene gas, their construction being such that their placing on any desired position, calls for little preparatory work. The low pressure system of gas generation is adopted, as



Fig. 5—Interior view of lantern testing room.

for the buoys, and the same features of reliability, ease of handling and duration of lighting period applies as well.

Explosive Fog Signal, Bell and Whistle.—This apparatus is intended for occasional use only, as found necessary on account of fog conditions, and consists of a bell or whistle, operated automatically by the explosion of acetylene gas at predetermined intervals.

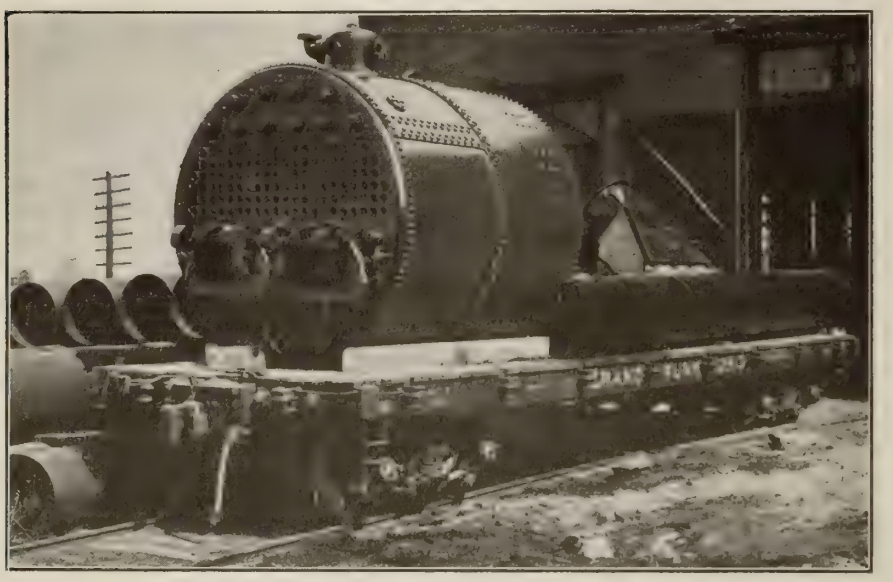


Fig. 10 Marine boiler.

Detail of Buoy Construction.

The buoy Fig. 6 consists of a gas generator tube of steel (1), supported by a steel float chamber (2), a lantern support (3), made of steel, and attached to the deck of the float chamber; a lantern (4), a purifier chamber (5), located at the top of the generator, and a counterweight (6), attached to the bottom of the generator tube, to give the buoy the necessary stability. The generator (1), has a diaphragm (7), a few feet from the bottom of the tube. The centre of this diaphragm is fitted with a conically seated valve (8), which is shown open. This valve is mounted on a valve stem (9), which passes up through the centre of the generator and through the generator head (10). The upper end of this valve stem is fitted with a hexagon nut (11), just above the generator head; the part of the stem passing through the generator head has a keyway cut into it, and a spline is fitted into the generator head, engaging the keyway, so that, when the nut (11) is turned to close or open the valve, the stem cannot turn—it can only move up or down. A stop collar (12) is attached to the extreme top end of the valve stem, with the object of preventing the nut (11) from being turned so far as to drop the valve and valve stem.

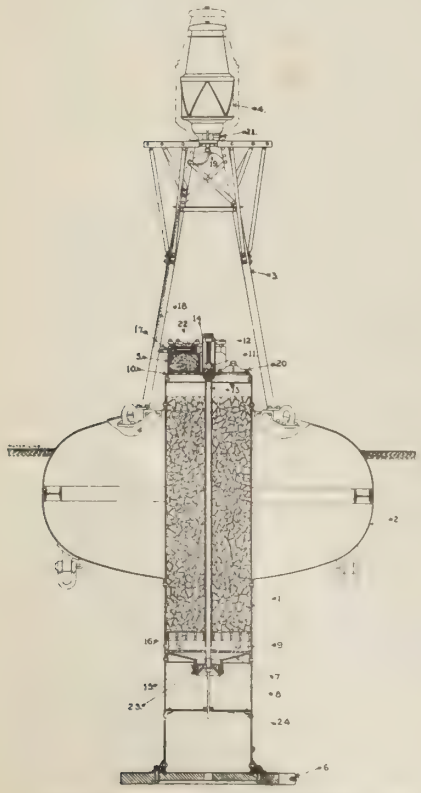


Fig. 6—Sectional view of buoy.

To prevent leakage of gas when the buoy is in operation, a cap (14) is screwed down upon the generator head against a rubber packing. This cap is long enough to permit of the valve stem (9) being raised or lowered so that the valve (8) may be adjusted to give an opening suitable for the conditions under which the buoy may be working. The valve stem is enclosed within a guard pipe (13), to protect it from the carbide, and it works through a guide bar (24), which is bolted to shelf angles at the side of the generator tube. In the centre of the diaphragm and surrounding the valve (8) is fitted a grid (23), which prevents small pieces of carbide, which may pass through the grate (16), from falling into the water and wasting their gas. This grid (23) acts also as a valve seat, and is provided with a rubber packing (15), which is held in a groove in the seat, and projects sufficiently to make a good joint with the valve (8) when it is closed, even if it be foul. A steel grate (16), upon which the carbide rests, is attached to the inside of the generator, a short distance above the diaphragm.

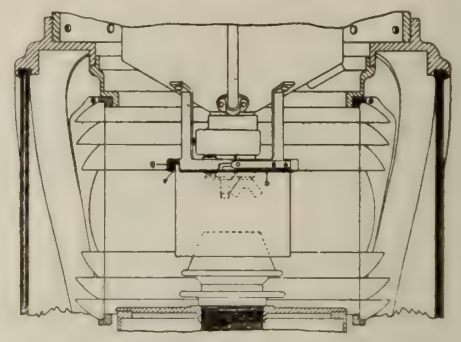


Fig. 8.—Application of Colored Glass to Lantern.

Operation of the Buoy.

The generator (1) is filled with calcium carbide in large crystals, 8 in. by 1 in., as shown in Figure 6, and the buoy placed in the water with the valve (8) open, and the valve cap (14) screwed down. The water enters the generator tube through the hole shown in the centre of the counterweight (6), and passes through the valve up to the carbide resting upon the grate. The contact of the water with the carbide immediately produces gas, which passes up through the carbide, into the purifier chamber, where all impurities and dust are remov-

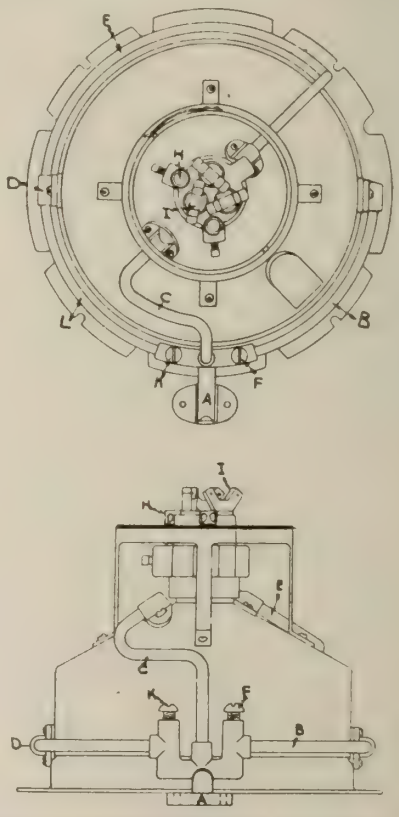


Fig. 9.—Flashlight Mechanism for Lantern.

ed ; thence it proceeds through the small valve (17) and pipe (18), to the lantern (4), to which the pipe is connected by the coupling (19).

If gas is produced faster than consumed by the lantern, it accumulates in the generator at an increasing pressure which gradually forces the water away from the carbide, and stops generation. In the figure the water is shown in this position. As the surplus of gas is consumed by the lantern, the gas pressure gradually decreases, thus permitting the water to come in contact again with the carbide, when generation is resumed. In this manner the buoy is absolutely automatic in operation. From the moment the charged buoy is placed in the water with the valve open there is always a sufficiency of gas, and never too much to cause trouble.

Lantern.

Figure 7 shows in section the construction of the lantern and the pressure regulator. The light is given by a cluster of flat flames with round pilot flames. Surrounding the burner is a Fresnel lens which give to the lantern its property of projecting a beam of light to a great distance.

Colored glasses may be applied to the lanterns without material alteration, see figure 8, which illustrates the application of colored glass to them. The glass is securely set in the inner frame A, which fits within the stand B, and is secured by a bayonet joint and locking spring C. The glass can therefore be quickly removed from or applied to, a lantern without the removal of the stand B. Red or green glasses can be fitted, as desired, and applied to either fixed or flash-light lanterns.

Flash-light mechanisms are used on these lanterns and are convertible, figure 9. A is the inlet of the gas from the lantern regulator. The supply of gas to the pilot tips H, which burn constantly, is by way of the pipe C. Pipe B leads to the flash apparatus, and, after passing through the latter, the gas is conducted through flange D and the pipe E to the flat flame burners I.

These flashing apparatus are adjusted, to give equals intervals of light and darkness, usually periods of two seconds each in the 200 M.M. lanterns and five seconds in the others. The period of darkness can be varied by adjusting the screw F figure 9, but the period of light can only be changed by increasing or decreasing the rate of consumption of gas, or by reconstructing the apparatus. When being used as a flash-light, the set-screw or needle-valve K is kept closed. Should it be desired to convert the lantern into a fixed light, simply open K, and the gas will pass directly to the burners I. On flashing apparatus the small pilot tips of the cluster serve as ignition flames, and are supplied with gas through the pipe C fig. 9 and burn continuously.

Burners.

The burner cluster is a special arrangement of flat flames to give the best effect through the lens. The main burners are of the flat flame type, and the pilots are of the round flame type. The main burners and the pilots are set into a bronze casting, which is fitted with screw conical valves for adjusting each pilot flame.

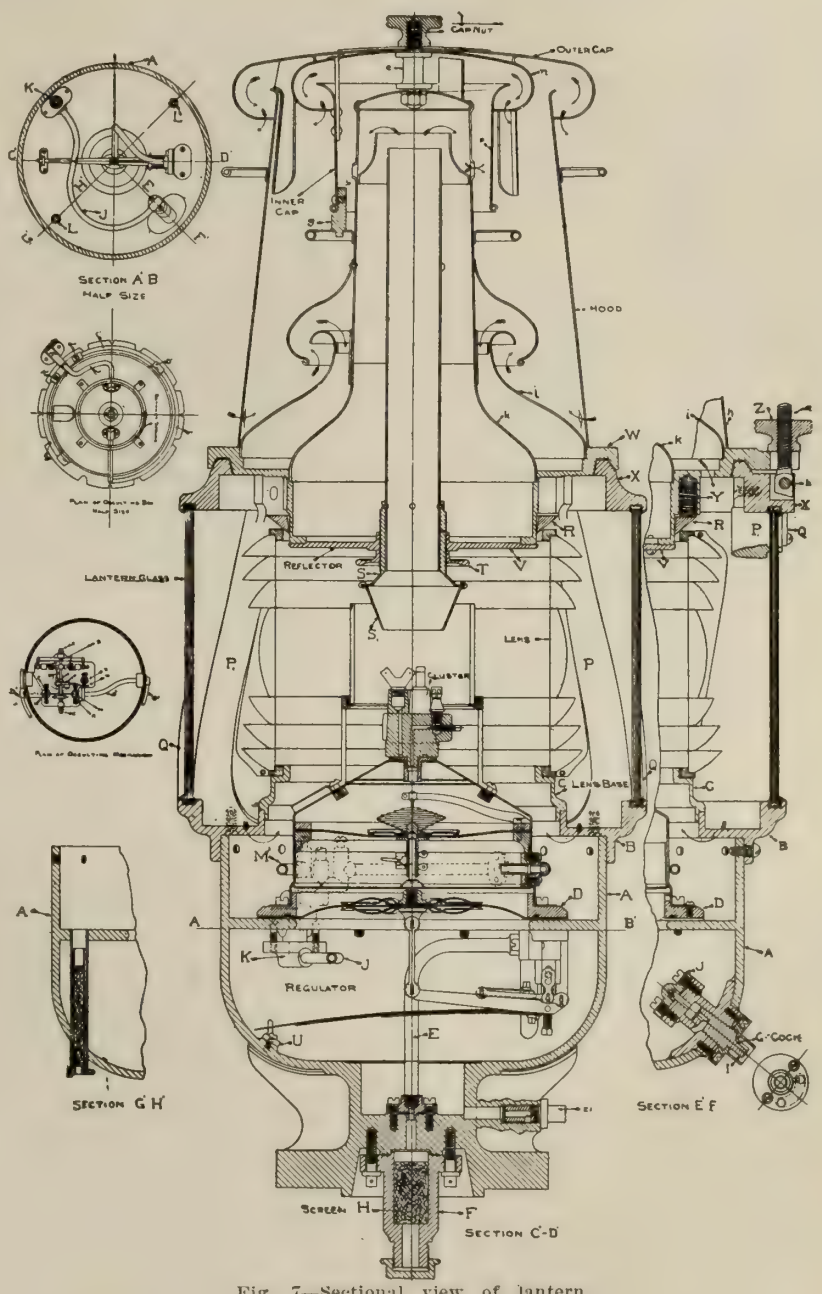


Fig. 7—Sectional view of lantern.

Designing and Testing.

Figs. 4 and 5 are interior views of the drawing office and testing departments respectively. In the former, from 10 to 12 draughtsmen are constantly employed on the design and detailed arrangement of the various forms of apparatus and equipment manufactured. In the latter, expert mechanics test and adjust the lanterns for each individual location requirement. Further, in this connection, there is provided at the shops a water tank 20x15x20 feet, into which all buoys with their full equipment are placed, and subjected to such tests as are likely to be service conditions in all weathers.

Other Lines of Manufacture.

Besides buoys, a number of other lines are manufactured and represented. Steel structural work of all kinds is fabricated and erected, while tank work, land and marine boilers, form special departments through which a considerable business is done.

In the more strictly machinery line, crane work of all descriptions is undertaken. Filtering, icemaking and refrigerating machinery, as manufactured by the Pulsometer Engineering Co., Eng-

land, and the Petter Oil Engine, are two of the important Canadian agencies held by the company, and through both of which a profitable demand is being met.

Thomas L. Willson is president and John Bain secretary. The former, as already stated, being the discoverer of commercial acetylene and the latter a gentleman of matured business management experience in several successful enterprises. Both have been connected with the company since its inception, and much of its success and present prominence is due to their combined efforts.

CENTRIFUGAL COMPRESSOR FOR CUPOLA USE.

By Richard H. Rice, West Lynn, Mass.

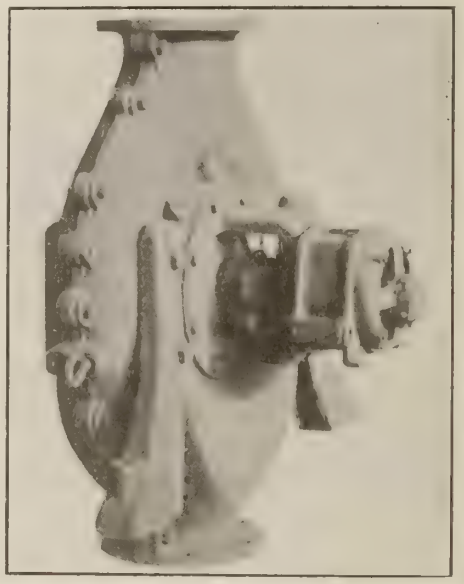
THE problem of proper air supply for the operation of a foundry cupola is in many respects analogous to that of a blast furnace. The latter, however, requires much larger volumes of air, and under more arduous conditions, because its operation is continuous for many months. The foundry cupola on the other hand, is in operation only a few hours each day. Again, foundry cupola conditions are improved, due to the differences between the physical characteristics of the charge of pig iron, as compared with those of the ores charged in the blast furnace. We find the blast conditions in the cupola much more uniform, therefore the requirements for its proper operation under all conditions can be met by apparatus which produces practically a constant pressure. In blast furnace apparatus, constant volume is the prime requisite, and apparatus must be provided capable of working under a considerable range of pressure, in order to meet the fluctuating conditions.

Results From Blast Furnaces.

Centrifugal compressors, of the same general type as that which I wish to bring to your attention, consisting of one or more rotating impellers in series, taking air at atmospheric pressure and compressing it as required, to say 12 or 15 pounds average, and 25 to 30 pounds maximum pressure, with provision for a constant rate, have been used on blast furnaces for some five or six years in England and on the Continent. No machines, however, were put on a blast furnace in this country, of the type mentioned, previous to March, 1910. The first machine was put to service at the plant of the Empire Steel & Iron Co., Oxford Furnace, N. J., and was found to be absolutely adapted for the requirements of blast furnace blowing. A number of machines are under construction for similar situations of various capacities, because of the good results obtained by this first installation. Similarly, on cupola work in the iron foundry it has been found that this type of apparatus is perfectly adapted for the same reasons which make it attractive for blast furnace service.

Extreme Steadiness of Blast.

One of the important points in connection with this apparatus, is the extreme steadiness of the blast. You are, of course, aware that the steady melting of iron and the steady descent of the charge from the cupola are dependent



Type T-1-800-1-3450 Centrifugal Compressor Driven by Type Kt. 2-5 h.p. 3600 R.P.M. Induction Motor. Index E-318.64—E-312.4.

on the maintenance of uniform conditions of air pressure, because the charge in the cupola is, to some extent, supported by the pressure of the blast, and if this varies, the charge is likely to descend in a more or less irregular manner. Such irregular descent of the charge means unsatisfactory working of the cupola, therefore, the uniform, steady blast produced by the centrifugal compressor, produces more ideal conditions of melting.

High and Maintained Efficiency.

Another point of importance, is the high efficiency of the centrifugal compressor, maintained after long periods of service. This is due to improvements in design, as compared with centrifugal fans used also for this purpose, but wasteful in power absorbed. The improvement over centrifugal fans consists in changing the velocity, by a gradual slowing down of the air, in a definite manner, without production of eddies.

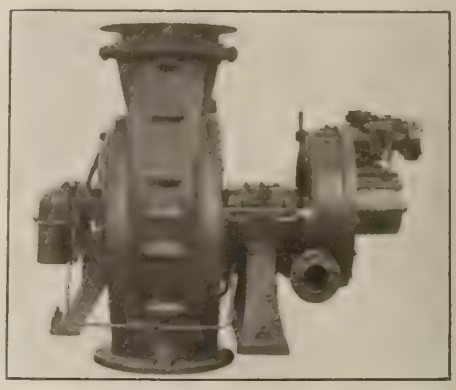
The apparatus is capable of maintaining its high efficiency because there are no rubbing surfaces. The impeller is the only moving part, and since it rotates with ample clearance on all sides, it always compresses air with the same efficiency. The parts which slow the air down are stationary and not subject to wear, therefore, no matter how long the machine be in operation, the efficiency will remain absolutely unchanged.

Actual Efficiencies Obtained.

As regards actual efficiences obtained, let us discuss this question in comparison with other forms of cupola blowing apparatus. I do not propose, however, to enter into technical or scientific discussions of the question, because strictly scientific comparison is difficult, owing to the fact that the positive pressure blower commonly used discharges its air in the form of a pulsation or wave at varying pressure in the discharge pipe, and is consequently difficult to test for volume. The usual method of determining the volume discharged by a positive pressure blower, is to calculate the displacement of the impellers per revolution, and from this by determination of the speed, estimate the quantity of air which is discharged. The quantity so found is called "displacement air." Such experiments as we have been able to make, indicate that the displacement air may be 15 or 20 per cent. in excess of the actual quantity delivered by the blower.

The means available to test the volume of air discharged by apparatus of this nature do not give a true average, and therefore are not sufficiently accurate to give a thoroughly scientific test. Approximations can be made, but these are always in favor of the positive pressure or reciprocating machine, since the quantities of air given are always excessive. However, if precautions are taken to measure the pressure and volume at the end of a long pipe of large capacity, so that the fluctuations in flow and pressure are reduced to a considerable extent, fairly accurate results are possible.

It is legitimate to operate blowers of different types on a furnace under exactly the same conditions, to determine their power input and furnace output in tons of iron melted. This method forms an excellent means of comparing appar-



Type T-700-72-3500-Form O Centrifugal Air Compressor Coupled to 50 h.p. Curtis Steam Turbine, from A-5, Running at 3500 R.P.M., for 110 Pounds Boiler Pressure.

atus. Such comparisons have been made between the fan blower, the positive compressor blower and the centrifugal blower, with the result that the power input required to melt down the same quantity of iron is less with the centrifugal compressor than that of the others. The positive pressure blower comes nearest to the compressor, but there is still a reasonable margin of difference in favor of the latter.

Centrifugal Compressor Superiority.

The following points of superiority are claimed for the centrifugal compressor cupola blower.

1. High efficiency. 2. Maintained efficiency. 3. Uniform, steady blast, producing steady, uniform operation of the furnace. Other advantages exist, but of somewhat less importance, such as less floor space, less weight, fewer bearings and less maintenance, because less wear. The centrifugal compressor has two bearings, automatically lubricated, which do not come into metallic contact, and, therefore, do not wear.

Description of Centrifugal Compressor.

The apparatus consists of a shaft supported in two bearings, carrying on one end an impeller of the most rugged and substantial construction, and on the other, between the bearings, the rotor of an electric motor, or turbine wheel of a steam turbine. In the case of motor drive, alternating or direct current may be used. In the case of a steam turbine the steam may be of any pressure from 100 pounds upward, and may be discharged into the atmosphere, or be run condensing. The high speed motors used are built along lines which are the result of extended experience and are reliable and satisfactory. The steam turbines are of great simplicity and high efficiency. Since compressor and turbine show best efficiency when running at high speed, their combination is most desirable.

Difficulties Encountered.

The principal difficulty met in the installation of such compressors has been that the air requirements were overestimated by the purchaser. In many cases, the apparatus installed was found to be too large. This is due to the fact that all data compiled on cupola air requirements has been based on displacement. T sts were made under my direction on a cupola melting iron in an efficient fashion, and it was found that the quantity of air required showed considerably less than that usually reckoned. For instance, the established rule in the selection of positive pressure blowers for iron foundry cupolas is based on an allowance of 30,000 cubic feet displacement for one ton of iron. This has been reinforced by computations of the number of cubic feet of air required for burning one pound of carbon to CO_2, and by the further experimental fact that one pound of coke is sufficient to melt ten pounds of iron. The computation which is the basis of the statement that 150 cubic feet of air are required per pound of carbon burned to CO_2 assumes that coke is pure carbon, which is not the case. Coke contains only about 90 per cent. carbon, and is not all burned to CO_2. A great deal is burned to CO, requiring only about 90 per cent. of the air required if the whole were burned to CO_2. The result of these qualifications is that only 80 per cent. of the theoretical amount of air above computed is actually needed. This 80 per cent. efficiency of the air necessary is also about the difference between the actual air discharged by a positive pressure blower and the computed or displacement air, therefore the rule is correct for positive pressure blowers, but not so for computations of the actual quantity needed. The tests mentioned confirm these figures. They showed that one pound of coke would melt from 10 to 12 pounds of iron, the variation being apparently due to the difference in temperature of the iron tapped off. The conclusion is that the ratio of one to ten, as commonly used, is reasonably correct.

Accurate Test Measurements.

The tests involved accurate measurements of the quantity of air passing into the cupola, and showed that 24,000 cubic feet of air was sufficient to melt a ton of iron, or 400 cubic feet of air per minute would be required for each ton per hour. This figure agrees exactly with the 30,000 cubic feet of displacement air usually assumed in positive pressure blower work at a volumetric efficiency of 80 per cent. Enough tests have been made to warrant the statement that these figures are correct, and should be used in proportioning blowers for cupolas made on the centrifugal compressor design.

Tests made by the above method on apparatus delivering a steady blast without pulsations are extremely accurate, the accuracy being such that a possible error of one to two per cent. is the limit.

A NEW HOSE COUPLING.

The Noon Universal Coupler Co., Kent Building, and 35 Richmond street E., Toronto, have introduced a hose coupling of novel design. It is one of the probably few couplers on the market, which has the hose inserted in the shank, instead of vice-versa. The method adopted has these and other important advantages. The hose cannot blow out, since the higher the pressure, the more tightly is the hose gripped. Further, the full area of the hose is always available, due to the shank of the coupling being outside instead of inside.

The two halves of the coupler are joined by a double thread of $\frac{1}{8}$ inch square section; $1\frac{1}{2}$ turns completely locking the device. Gaskets are rendered unnecessary, by bringing the end of the hose about 3-16 inch beyond the end



Fig. 1.—Noon Hose Coupling.

of the screw thread in the female part of the coupler, and about 1-16 inch in the male part. Both ends of the hose are thus forced firmly together, and make a tight joint. From this, it will be noted, that water, air, steam, etc., passing through the hose, never comes in metallic contact, with the result that risk of freezing up is reduced to a minimum.

Fig. 2 shows the method of inserting the hose. Part of the shank, in both halves of coupler, is removable, and has

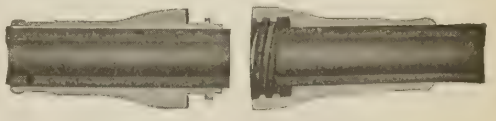


Fig. 2.—Noon Universal Coupler.

a lip at the front, which engages inside the end of the screwed portion. After the hose is inserted through the gap and the cover replaced, a wire is twisted round the neck of the shank.

H. B. Tilley, manager of the Bruce Peebles Co., Manchester, England, has left for an extended business tour in Canada on behalf of his firm. Mr. Tilley will visit all places of importance in the Dominion, and expects to be away for a year.

Mr. A. W. Wheatley has been appointed general manager of the Canadian Locomotive Co., Ltd., of Kingston, Ont. Mr. Wheatley has been manager of the Brooks plant of the American Locomotive Company at Dunkirk, N.Y.

The Standardization of Design and Details

By Harold Smith, Toronto

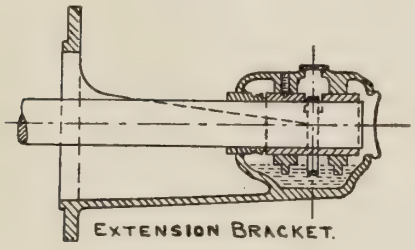
This Article is the Third of the Series; the First Having Appeared in Our July Issue. The Writer is an Expert on Standardization Work, and Consequently Speaks with Confidence, Born of Experience. Machinery Manufacturers, on a Large or Small Scale, Will Find the Different Subjects Treated, Both Interesting and Profitable.

THE design of a piece of machinery must meet two fundamental conditions:

1.—It must be efficient, i.e., successfully perform the work required of it.

2.—It must be commercial, i.e., so arranged that it can be produced at lowest cost.

The first condition admits of great latitude in design; the second narrows it down to certain limitations, peculiar in some extent to the shops where it is to be made, and depending on the apparatus and material available for doing so. From a production point of view, a machine consists of two classes of parts those which are standard, and those which are variable; the quantity made determining into which class it falls. Thus, in a factory manufacturing only specialized lines, every part being of



Self Oiling Bearing.

necessity handled in quantities, is standard; hence the commercial cost can be got down low, because the volume of business warrants special tools, pays for their initial cost.

On the other hand, in a factory which cannot specialise on account of handling a general business in a relatively restricted market, the machinery produced is to a large extent in variable units, and the parts of which it is composed, are as a rule, made in quantities too small to warrant much special tool equipment. Further, for a given business turnover, there is more drafting, clerical and supervision expense involved in the latter than in the former. For the one factory, $1,000 worth of business might mean 1,000 pieces put through on 10 orders, and in the other, 1,000 pieces on 100 orders. An individual order requires approximately the same amount of non-productive expense, labor and attention for a number of pieces as for one piece.

Standardization is then admittedly an important factor in enabling a shop to produce articles at a low commercial cost, and every effort should be made to introduce it where possible. At the same time, care should be taken that the fundamental idea of efficiency is not endangered.

Standardization Applications.

We have standardization for pieces in common usuage, which are sold under the title of supplies, such as valves, pipe fittings, etc. From their standard parts, we can build up any number of variable piping combinations. It is not suggested that a piping arrangement is a machine, but the elementary ideas of production are analogous.

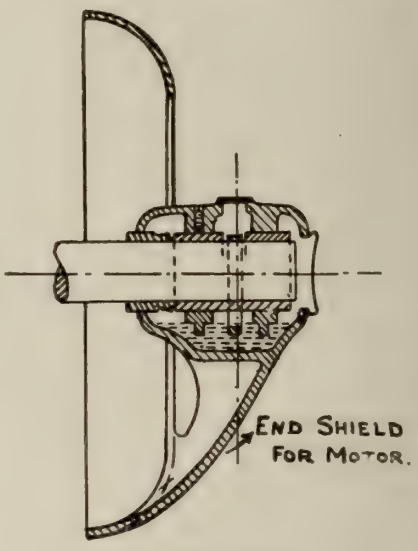
We have here standard parts, valves, flanges, elbows, plugs, etc., which can be manufactured in lots. Variable items, as lengths of pipe, must be made to order. The whole forms a variable unit which will of necessity be handled in small quantities, yet by reason of the standard parts, may be produced at low cost. In a similar way, most machinery can be analysed into standard components, fundamental either to mechanism generally or to a particular machine, and into those which are variable. The best commercial design being that which uses to advantage the largest proportion of standard pieces.

Standardization does not mean an awkward looking creation, in fact rather the contrary, for it makes for uniformity of appearance, in any particular firm's product. The idea of the sectional book case, as developed by furniture manufacturers is a good illustration of the advantages of standardization. What is to them a great advantage from a manufacturing point of view, in that they can cover a maximum of combination with a minimum of standard parts (and incidentally of stock), is put to serve as a strong selling point.

Standardized Self-Oiling Bearing.

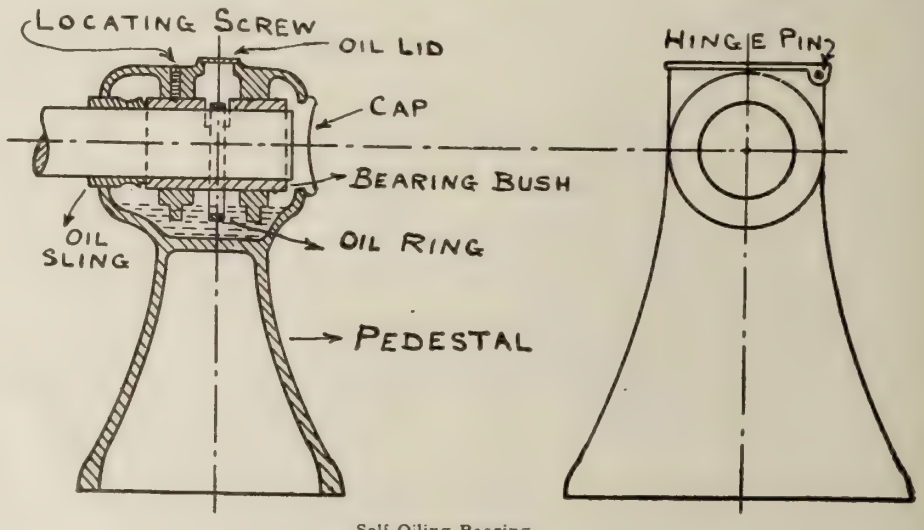
As a typical illustration of the possibilities of standardization in design, take a self-oiling bearing. This in a general way consists of 8 parts as per illustrations; of which only one need be variable. The oil sling, locating screw, oil lid, hinge pin, brass cap, bearing bush and oil ring may be kept the same, whether the bearing is carried in a pedestal or not. The end shield, extension bracket, frame, etc., are variable according to the machinery to be designed.

It is obvious that if such a scheme were carried out persistently, in course of time a demand for these standard parts would be created and warrant their be-



Self Oiling Bearing.

sing made in stock lots. Even if this be not attainable in all cases, it is a great advantage for the shop to have their



Self Oiling Bearing.

variety limited. Pattern expense is saved, and it may be noted in this particular case that the same core box will do for all the bearings.

This particular illustration would effect following economies:

Economies Effected.

Oil Sling.—This has to be machined all over (an awkward shaped profile) and shrunk on to the shafts. Made singly, it would be produced from a brass casting and machined in an engine lathe. Made for stock it can be cut from steel tube, using a profile cutter and hollow spindle lathe.

Locating Screw.—Purchased in either case, but excess quantity bought, is dead stock in one and live in the other system.

Oil Lid.—Singly, cast from wood pattern. For stock, cast 18 at a time from metal spray pattern, castings are accordingly much cheaper.

Hinge Pin.—Same as locating screw.

Cap.—Singly, a circular plate would be cut from stiff sheet brass and fastened to oil box with machine screws. For stock, all stamped, like a can lid, and from scrap sheet iron of thin gauge. No screws used.

Bearing Bush.—Singly, machined in brass lathe without special tools. In lots, use can be made of boring bars, cutters and reamers, also special expansion mandril.

Oil Ring.—Singly, in brass lathe. Castings being uneven, have to be machined all over, a fair amount of scrap resulting. In stock lots, cast from metal plate pattern, so close that they only require boring (9 at one setting) in a box chuck and touching on sides with a disc grinder. Very little scrap made.

Total saving $1.70 per bearing.

Relative Total Production Cost 1¾-in. Bearing.

Item.	Singly.	Stock Lots.
Oil sling	50 cents	20 cents
Locating screw ...	Same for both.	
Oil lid	8 cents	1 cent
Hinge pin	Same for both	
Cap	15 cents	2 cents
Bush	$2.00	$1.10
Oil Ring	50 cents	20 cents

Total saving $1.70 per bearing.

Full advantage should be taken of what can be purchased already standardized, by other manufacturers, such as eye bolts, keys, bolts, screws, brass fittings, shaft collars, dowel pins, etc., as against making them up for any job.

Standardized Carbon Brushes on D.C. Motors.

A further example which illustrates forcibly, how much can be standardized when it has to be done is the British Admiralty rule with regard to carbon brushes for direct current motors used on battleships. They allow three sizes of brush only. These are stocked by them as ordinary supplies, and served out to ships in any part of the world, without danger of misfit.

When it is appreciated, that they are buying motors from at least 25 to 30 firms and that each of these has at least 5 or 6 standard motor brushes of their own, the wisdom of the rule will be apparent. They stock three sizes, where otherwise they would have 100 to 150. Besides, there is less danger of leaving some particular ship out of brushes on a distant station. In this instance standardization makes order out of a very probable chaos.

Their standards are furthermore arranged, so that the largest brush cut in half makes 2 of the next size, and that in turn cut in half, makes 2 of the size smaller. All of the brushes are of course, rectanguhar.

The successful operation of a D.C. motor is largely dependent on its proper commutation. This is established by having width of brush, pitch of bars and volts reactance finely proportioned. It required a strong hand to force such standards on electrical manufacturers, each with their own peculiar technical points, and which in the ordinary way, they would insist on, as essential.

Summed up generally, a workshop which standardizes, is put in a position where it can "manufacture," as against one where it can only "make."

LARGE STEEL CASTINGS.

Two large and interesting steel castings were recently made at the works of the Joliette Steel & Iron Foundry Co., Joliette, P.Q. They consisted of Y pipe connections for the intake of a 10,500 horse power Doble impulse water wheel, and were to the order of the John McDougall Caledonian Iron Works, Montreal, who are building the wheel. Each casting weighed 10,000 pounds. The Joliette Steel & Iron Foundry Co. started operations at the beginning of the present year, and have equipment and facilities capable of turning out castings up to 15 tons. S. Vessot, a gentleman prominent in connection with Joliette interests, is president of the company, while J. D. Query, who has had a wide experience in steel foundry practice, is in charge of the company's Montreal office.

RAIL-LESS STREET CARS.

The first rail-less street cars propelled by electricity to be used in England have just been installed by the City Council of Leeds. The system at present is an experimental one and is being closely watched with a view to its early adoption in other cities if successful. The wheels of the new cars are fitted with rubber tires and are attached to the overhead wires by a double trolley arm. The overhead equipment cost about $6,000 per mile and the cost of each vehicle is about equal to that of an ordinary tramway car. The double trolley arm, acting on a swivel, permits of liberal deviation on either side of the road, thus allowing the vehicle to wind in and out of the traffic when necessary. Each car is made to hold 28 passengers. Only one entrance is provided and the driver sits in front in charge of the controller and steering wheel, and at the same time collects the fare from each passenger on entering.

As there is no metal track to be laid down and kept in repair, the running cost is expected to be considerably less than that of the ordinary cars. This type of car has been introduced to meet the requirements of certain outlying districts, which owing to their thinly scattered population could not maintain an ordinary service with profit. In these cases, it is thought that the system of rail-less traction with its low cost of maintenance, can be advantageously employed both to the benefit of the tramway service and the community. The city of Dundee, Scotland, is also installing a similar equipment.

LEAD PENCIL EQUALS TWO-MILE FREIGHT HAUL.

A new method of demonstrating to employes the importance of saving small things, is set forth by the Pere Marquette Railroad in the current issue of the railroad employes' magazine. Where several other roads have shown their employes how five or ten cents a day may be saved, the Pere Marquette presents a table showing the cost of various small articles commonly wasted, in terms of mileage for a ton of freight.

Every time a postage stamp is used needlessly the company must haul a ton of freight 3½ miles. Other simple examples are: Lead pencil, 2 miles; track spike, 2 miles; one lamp chimney, 10½ miles; station broom, 35 miles; lantern 100 miles; track shovel, 90 miles; 100 pounds of coal, 20 miles; one gallon engine oil, 50 miles.

A farewell dinner and presentation was tendered K. A. McKenzie at the Engineers' Club by the Alumni Society of the faculty of applied science of the University of Toronto on the evening of August 16. He left that evening for the west. He will proceed to Vancouver, B.C., where on the 15th of September he takes up a position with a Vancouver syndicate, which is taking up the development of some large water-powers in British Columbia.

MACHINE SHOP METHODS AND DEVICES

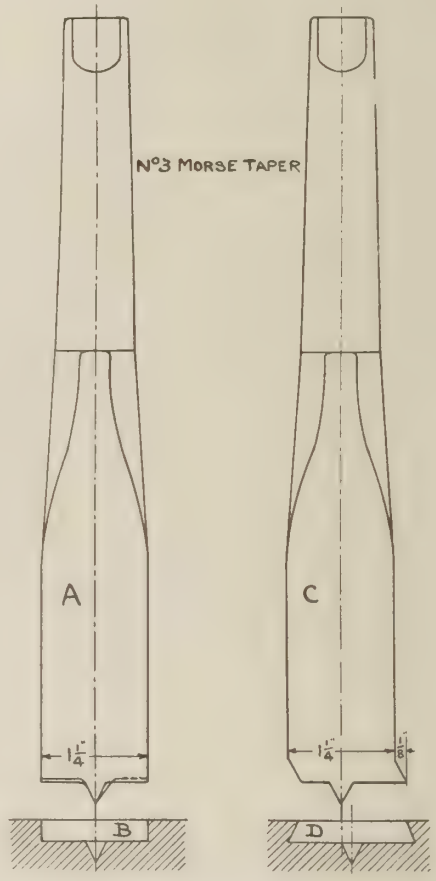
Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

DRILLING TAPER HOLES.

By J. H., Hamilton.

LOCOMOTIVE axle boxes are frequently babbitted on the face that goes next to the wheel hub, and one method of holding the babbit in place is to provide a number of shallow recesses which are larger at the bottom than at the top as shown at D. These recesses are generally cored out, but at the shops of the Toronto, Hamilton and Buffalo Railway, they are drilled by means of the two drills illustrated. The flat drill A, with small pilot point and cutting edge performs the first operation as shown at B, while the second flat drill C, finishes the hole as shown at D.

The point on C has no cutting edge, being round. The axle box is not secured to the drill table in any way; therefore, when the point on drill C is brought down, so as to just engage the shoulder of the small conical pilot hole formed by the cutting point of A, the box is gradually forced over under the influence of the feed until the centre of the hole coincides with the centre of the drill, and results in the offset edge of the drill cutting the side of the recess parallel with the slope of the pilot cone. In the example illustrated, the hole is 1¼ inches diameter at the top, and 1½ inches diameter at the bottom.



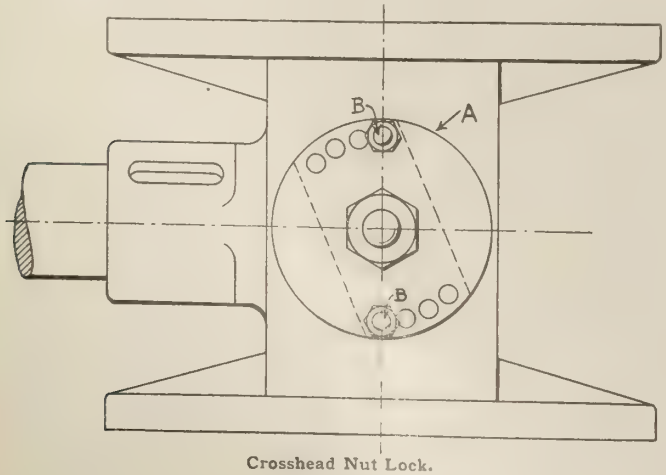
Drilling taper holes.

A CROSS-HEAD NUT LOCK.

By A. B., Stratford.

In this locking device, the circular plate A, has a hexagon cut out at the centre, which fits the nut on the crosshead pin. Two studs, B in the crosshead, prevent the plate from turning, and therefore the main nut is securely locked. The additional holes in part A, allow the main nut to be tightened up 1-24 of a complete turn, and their location is obtained by dividing the quarter circle into six equal parts, and drilling them at the first four points so determined.

Where appearance is of no consequence, a good deal of weight may be saved by cutting off the plate A, along the dotted lines..



Crosshead Nut Lock.

A SIMPLE CHUCK.

By G. L. M., Montreal.

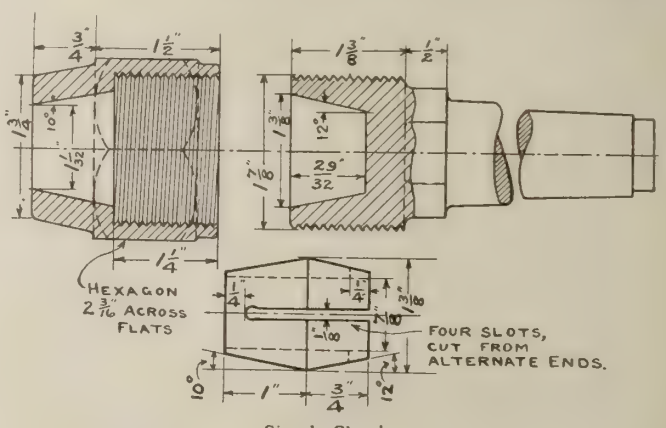
The chuck which we describe and illustrate, is suitable for small milling cutters, chucking reamers, drills, etc. It exerts a powerful grip on the tool, and has proved highly satisfactory in service. The sketch shows the construction so clearly, that little detail explanation is necessary, beyond remarking that the bushing or collet has four slots cut to within ¼ inch of the end, to enable the screwed cap to compress it upon the shank of the milling cutter or other tool. The collet is preferably made of crucible steel, and hardened.

AN ADJUSTABLE HOLLOW MILL.

By R. A. S., Toronto.

An adjustable hollow milling tool, having an extra independent cutter is a handy appliance to have around a shop. The one illustrated, consists of a cast iron stock, Fig. 1, slotted on the face for the cutters, Fig. 7. These are adjusted by means of the cam ring Fig. 3, and a clamping ring, Fig. 4, fixes both to the face of the stock, as shown in Fig. 2.

The independent cutter is not engaged by the cam ring, but is operated by the handle and lever shown in assembly drawings, Figs. 5 and 6. Fig. 7 shows on the left, one of the adjustable cutters, and on the right, the independent cutter. The latter has its cutting edge shaped to suit the nature of the job required, and is forced down on the work, after the regular cutters have reduced the stock to size. An example of work that may be done by the independent



Simple Chuck.

cutter, is a notched shaft, shown in Fig. 8.

The tool has a large range of adjustment, with each set of cutters. Thus, a 1 inch mill, will reduce from 1 inch to 9-16 inch diameter, with one set of cutters. It will be noted, that the cutter shoulders against the cam ring at A, thereby ensuring at all points of adjustment, a solid body to securely hold them and prevent their springing away from the cut. This arrangement makes the tool quite as suitable for heavy cuts as for work requiring fine adjustment.

To adjust the cutters to size, or to remove them from the mill, it is only necessary to slacken the screws in the clamping ring, half a turn, and revolve the cam ring in the required direction by means of its knurled edge. When removing them, the cam ring is turned round, until it disengages with the grooves A. The cutters then fall down,

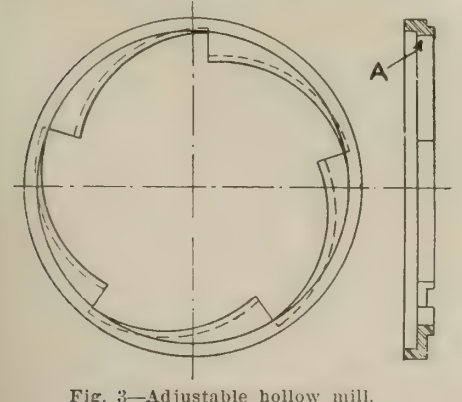


Fig. 3—Adjustable hollow mill.

and may be taken out through the centre. After being ground, they are returned to place in like manner. Graduations on the clamping and cam rings,

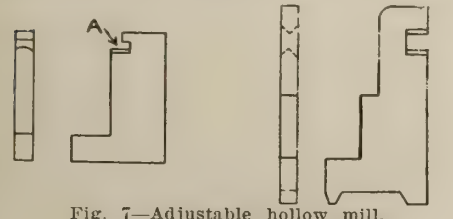


Fig. 7—Adjustable hollow mill.

make it easy to readjust cutters to the desired size.

By replacing the regular cutters with suitable dies, the mill can be made into a first-class adjustable threading die. A handle may be attached to the periphery of the cam ring, to open the dies when the full length of thread has been cut, thus saving the time and risk involved, in running back the dies off the thread. A United States patent for this device is held by R. A. Schrag, 12 Neipawa avenue, Toronto.

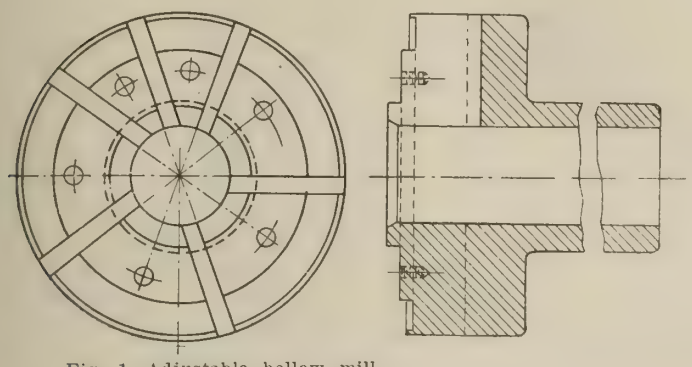


Fig. 1—Adjustable hollow mill.

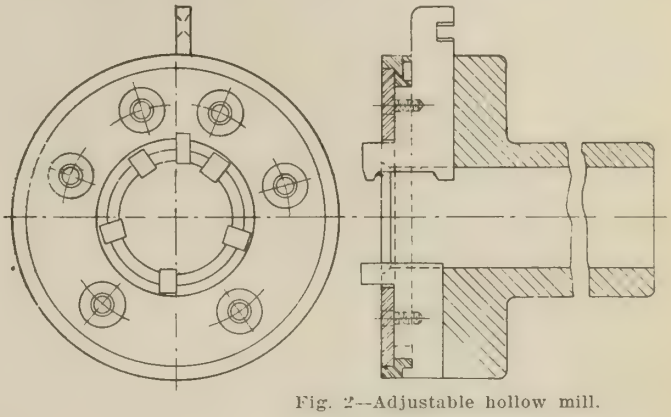


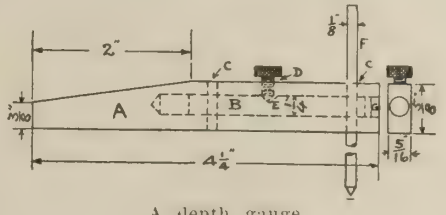
Fig. 2—Adjustable hollow mill.

A DEPTH GAUGE.

By Chas. Hattenberger, Buffalo.

The cut shows a form of depth gauge, made and found useful by the writer, in die work. The body A, of tool steel, has a ¼ inch hole drilled down its centre to a depth of about 2½ inches. B, is a piece of ¼ inch drill rod, which should be an easy fit when inserted in the above mentioned hole. C.C. are two 1-8 inch holes.

In making the gauge, one hole C is first drilled through the gauge body and



A depth gauge.

plug B. Then a piece of ⅛ inch wire is inserted to keep the latter in place, after which the second hole C is drilled. Plug B is next removed, and a hole drilled and tapped at D for a No. 8-32 thumb screw. At this point, B is replaced, and wires again inserted in holes C.C. Through the tapped hole D, mark off the position of the angular notch E, with which the point of the thumb screw engages.

It is advisable to file notch E a little

ROUGHING-OUT IRREGULAR SHAPES ON A LATHE.

By J. H. R., Hamilton.

In the accompanying sketch is shown a simple device for roughing-out irregu-

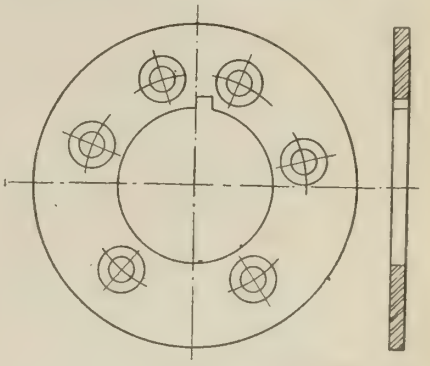


Fig. 4—Adjustable hollow mill.

lar shapes on the lathe. When turning an irregular shaped die or similar casting, the template must be tried on the work at intervals, to ensure the fit. With the device shown, the piece can be turned almost to a fit, with one application of the template.

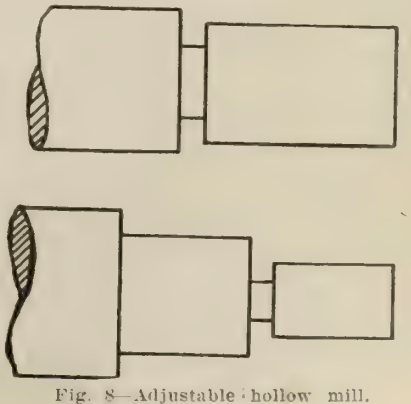


Fig. 8—Adjustable hollow mill.

A piece of heavy tin, T, is formed to fit tight on the cross-slide of the saddle, and placed in such a position, that it will clear the compound rest, when the

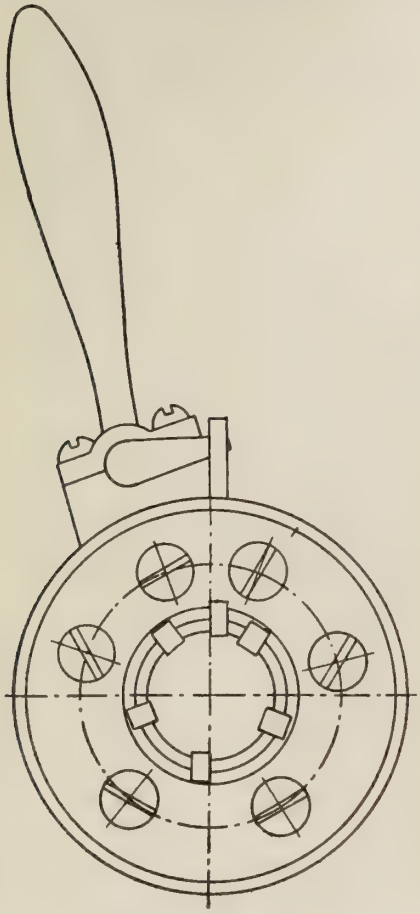


Fig. 5—Adjustable hollow mill—front elevation.

tool is cutting at the outside diameter of the work W. The outline of one-half of the template, is scribed upon this piece T, so that the axis would be in the same position as that of the work, or parallel with the shears of the lathe. A pointer P, is secured to the top slide of the compound rest R, so that any movement of the tool point, will move the pointer P in the same direction.

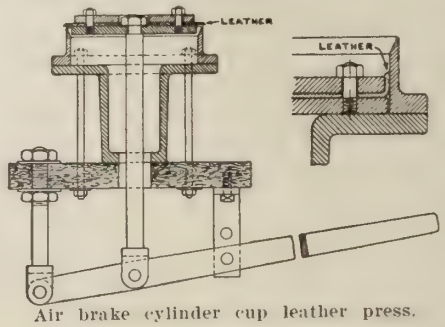
Care must be taken, to have the point of P, on the centre line of template, when the cutting tool is in the centre of the work.

Lock the saddle, and guide the tool, by following the pointer P; use the cross-feed S, and compound feed F, and the result will be the production of a very satisfactory job.

PRESS FOR AIR BRAKE CYLINDER CUP LEATHERS.

By J. H., Hamilton.

For cupping the piston leathers of air brake cylinders, most railroad shops use air, hydraulic or screw presses. At the shops of the Toronto, Hamilton and Buffalo Ry., Hamilton, Ont., a low cost and handy press, as illustrated, is giving excellent service. It consists of an old air brake cylinder cut off about two inches behind the front flange; the mouth of the casting is bevelled, and the whole apparatus mounted, and secured to a bench or table, by long bolts. The sketch explains clearly the details of the device.



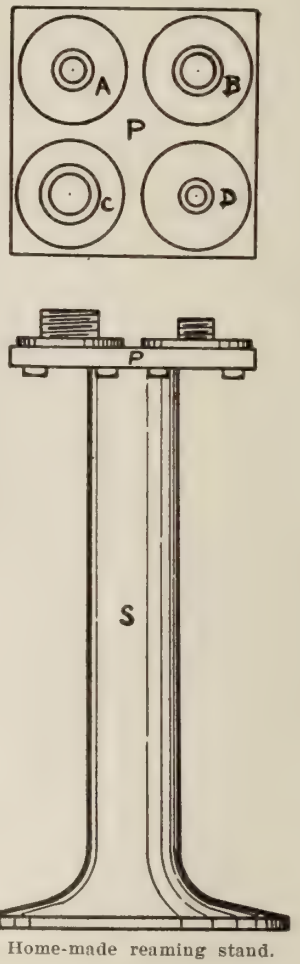
Air brake cylinder cup leather press.

An ordinary brake piston and follower with the leather placed between, is forced to the bottom of the press by means of the lever underneath the table, following which operation, the leather remains in position until thoroughly set.

HOME-MADE REAMING STAND.

By D. A. Hampson, Middletown, N.Y.

No one doubts the value of a reaming stand, even if the quantity of work involving its use be not great. We had



Home-made reaming stand.

need for one in the shop, but did not feel like purchasing it. In looking around, with a view to creating something of the kind, the writer hit upon

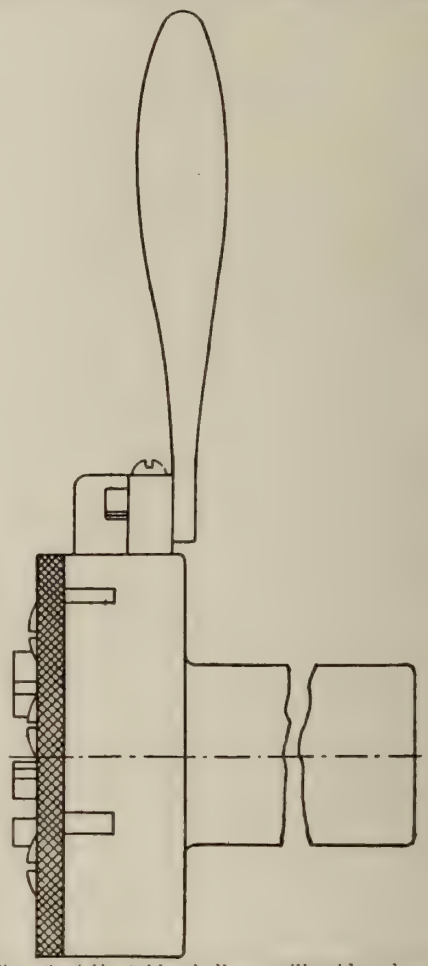


Fig. 6—Adjustable hollow mill—side elevation.

the scheme here described and illustrated.

A cast iron pillar S, which had stood unused in a corner for many years, offered possibilities equal to something that might have been specially designed for a reamer stand. It was accordingly pressed into service, and equipped as follows: Flanged castings A,B,C,D, were bolted to the square top of the pillar. Each had an upward projecting spigot with central hole, threaded outside, to correspond to the noses of our lathe spindles. When a number of pieces require reaming or tapping, a lathe chuck is screwed on to its particular spigot; the work being then chucked in the usual manner.

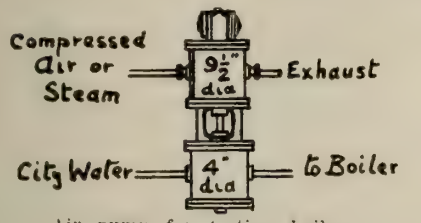
Sometimes it may be necessary to drill a piece of work, already fastened in the chuck. If so, remove the chuck from the reamer stand, and replace on the lathe. In laying-out, and small assembling work, or for holding round pieces during a number of operations, such a "reamer stand" will be found to give splendid service, and with a 3 or 4 jaw chuck, will be much more efficient and reliable than the 2 jaws of an ordinary vise.

A RATCHET STUD DRIVER.

By F. G. G., Montreal.

The ratchet stud driver here shown, while not new in principle, may prove useful to some readers of Canadian Machinery. The drawing being fully dimensioned, makes it possible for a tool room staff to build such a ratchet if they so desire.

When changing the socket; take out the ¼ inch set screw, raise the pawl clear of the ratchet, and remove the socket by means of the handle on top. The stud driver as shown, is well suited for the larger sizes of studs—say from 7-8 inch. upward; but for sizes smaller, it may be advisable to reduce the length of the handle, to avoid any risk of twisting off the stud.



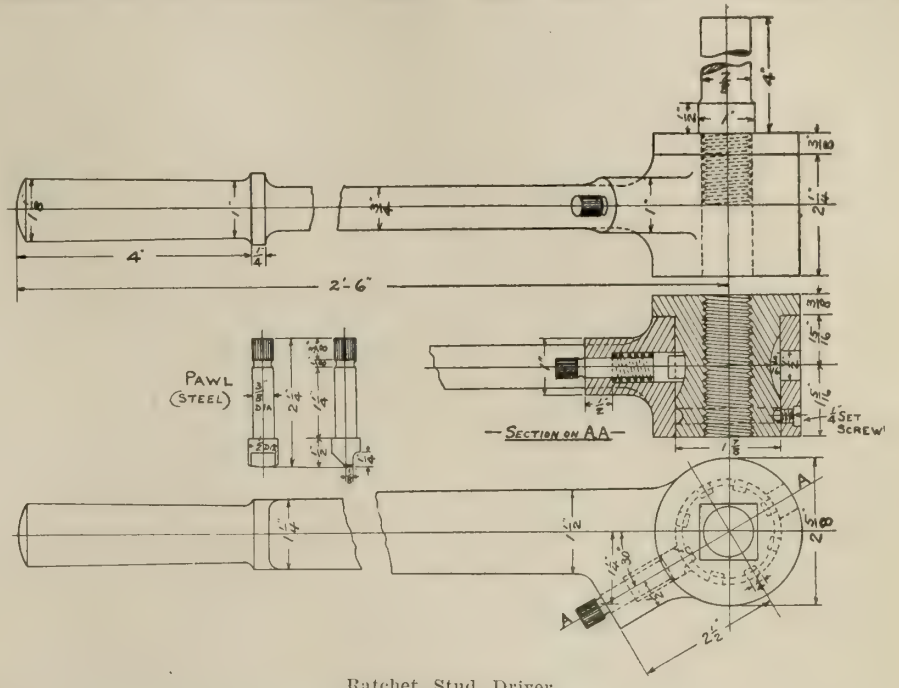
Air pump for testing boilers.

AIR PUMP FOR TESTING BOILERS.

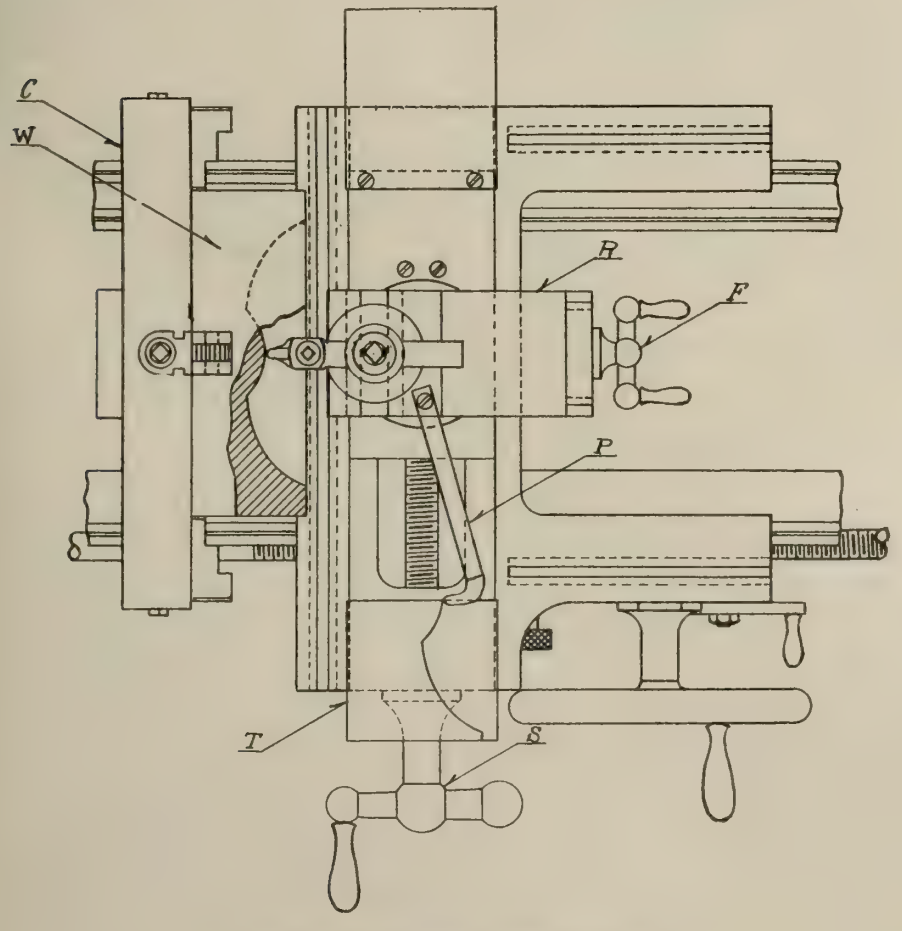
By W. F., Hamilton.

In railroad roundhouses, an ordinary 9½ inch. Westinghouse air brake pump is commonly used for applying the hydraulic test to locomotive boilers. The lower cylinder is bushed to say, 4 inches diameter, and the whole outfit is mounted on a light, two wheel truck, which can be readily moved around as required. The pump may be operated by compressed air or steam.

The suction side of the compressor cylinder is coupled to the city water supply, and the delivery side to the boiler under test. The area of a 9½ inch piston being 5.6 times that of a 4-inch piston, the steam or compressed air pressuee increases in that ratio in the compressor cylinder, therefore, the city water pressure will be multiplied accordingly.



Ratchet Stud Driver.

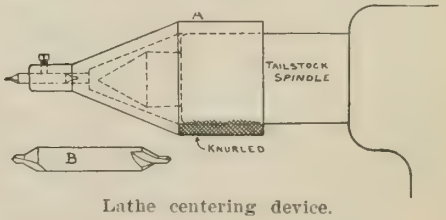


Roughing-out irregular shapes on lathe.

LATHE CENTREING DEVICE.

By Chas. Hattenberger, Buffalo.

The tool here shown, is easily made, and will be found extremely useful for centreing the ends of shafting, etc., in a lathe. It consists of a cup-shaped body A, made of soft machinery steel, and bored to fit snugly on the tail stock spindle. A hole drilled in the nose of body A, takes a combined drill and countersink. This latter is held in place by a set screw. The drill and countersink, drawn to a large scale, and shewn at B, are obtainable from most makers of twist drills.



Lathe centering device.

A SIMPLE OIL BURNER.

By W. H., Toronto.

The oil-burner here illustrated is used in the G.T.R., shops at Toronto for a variety of purposes, such as removal of locomotive tires, heating bent frames preparatory to re-straightening, heating

boiler patches, etc. The whole apparatus is easily portable and of extremely simple construction. The oil tank, with capacity of about 5 gallons of crude oil, is filled through a funnel fitted with a strainer, so as to preclude the possibility of choking the needle valve which controls the supply to the burner.

In front of the needle valve is a tee, into which is screwed a short length of pipe. At its end is a reducing coupling, forming a short cone, which serves to introduce atmospheric air to the oil pipe and is effective in causing a steady flow. Before this feature was adopted, it was found impossible to obtain a uniform and regular stream.

The compressed air pipe terminates in a piece of bent copper pipe, as shown in the separate detail of the burner. The issuing jet of air, creates a partial vacuum, and induces a flow of oil, which becomes vaporised as it enters the burner cone.

In taking off a tire, without removing the wheels from under the locomotive, the burner is packed-up on the rail, so that the flame strikes the tread of the tire at a small angle. The axle boxes are jacked-up, to bring the tire clear of the rail, and the wheel slowly revolved by bars to ensure the tire being uniformly heated all round. The time occupied averages about twenty minutes, depending to some extent, on the tire diameter.

EVOLUTION OF A LARGE INGOT.

By F. Walker, New Glasgow.

As a former employe of Cammell, Laird & Co., I was interested when reading the account given in the August issue of Canadian Machinery concerning the casting, slabbing and rolling of a large ingot by that firm at their Sheffield works. I have ventured, hoping it may be appreciated, to give from memory a brief description, together with dimensions and weights of the two tools used in the operations involved.

The mill built by Messrs. Cammell, from designs furnished by Davy Bros., Sheffield, has rolls of forged steel, 48 inches diameter, and 13 feet 6 inches length between housings. Each roll weighs upwards of 40 tons. The mill bed of cast steel is in 2 pieces, each of which weighs 65 tons. The housings are also in 2 pieces, of cast steel, and each piece weighs 37 tons. They are braced together at the top by a cast steel box girder, 49 inches wide, 45 inches deep, 18 feet long, and weighing about 35 tons. This crossbrace carries the screwing gear, also the steam and hydraulic cylinders for balancing the top roll. The total height of the mill is about 21 feet, its length 19 feet, and its width 13 feet.

The pinions are of cast steel, 48 inches diameter, 32 inches face, and have double helical teeth. The pinion housings are also of cast steel, and weigh about 20 tons each. The forged spindles between rolls and pinions are 25 inches diameter by 17 feet, 6 inches long.

The engine, geared to the mill in the ratio of 3 to 1, is of the simple non-condensing, 3-crank vertical marine type, and has cylinders of 40 inches diameter by 48 inches stroke. Walschaert's valve gear is fitted. The engine speed is 200 revolutions per minute, and the working steam pressure 200 pounds per sq. inch. The boilers of Lanchashire type are each 9 ft. diameter and 27 feet long. The engine design and construction was the work of Davy Bros.

The hydraulic press, also constructed by them, is of the vertical 4-column type, with twin rams 36 inches diameter by 6 feet stroke. The working pressure is 2½ tons per sq. inch, which gives a total load on the anvil face of 5,000 tons. The width between columns is 12 feet.

Two steam operated overhead traveling cranes, each capable of lifting 150 tons, serve the mill and press, these being housed in the same building. The cost of equipment, accessories and installation amounted to about two million dollars.

READER, WHAT DO YOU KNOW?

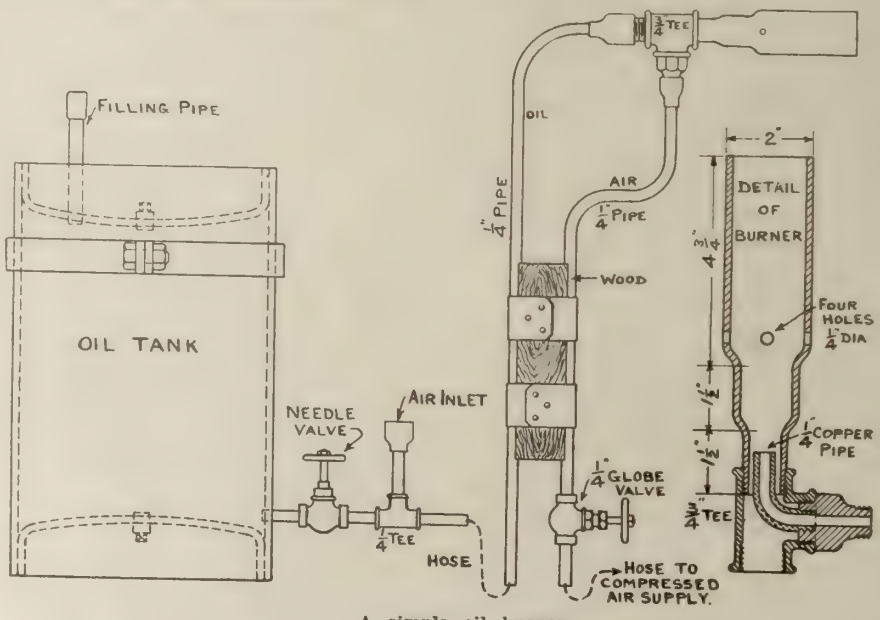
Among readers of Canadian Machinery there is a clearly defined sincerity of desire to know how each overcomes the daily tasks of the machine, pattern and blacksmith shops, the foundry and boiler shops. It is believed that your methods and devices, while good, may be improved, and thereby made more valuable if you publish them, so that other brains may work on them. We will provide the setting and pay you for the material. When your fellow tradesman puts the superstructure on your foundation, we pay him and pass the "kink" on to you, free. Get into the game.

TOOTHLESS SAWS FOR CUTTING STEEL.

The employment of high-speed revolving mild steel discs for cutting hard steel is coming into general use. The discs are preferably made of boiler plate quality, about a quarter of an inch thick. They revolve with a peripheral speed as high as 20,000 feet per minute. One of these discs will cut through a heavy channel section of hard steel, 12 by 6⅜ inches, in fifteen seconds.

It appears to act by local fusion. The very high speed causes thousands of inches of surface to impinge in rapid succession on the metal undercut, so that its temperature at the point of contact becomes very high. The disc, however, owing to the large surface area, remains relatively cool. All its frictional energy is concentrated on an extremely small area of contact. The work is done so quickly that the heat has no time to spread to the metal undercut, and the sides of the cut portion are only a little warmed.

Mr. W. Franklyn Evans, who has been chief engineer for over two years for the Expanded Metal & Fireproofing Co., Toronto, and their successors, Steel & Radiation, Limited, has resigned to join Mr. Geo. W. T. Nicholson, general contractor of Montreal.



A simple oil burner.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

27-48 INCH EXTENSION BED MOTOR-DRIVEN GAP LATHE.

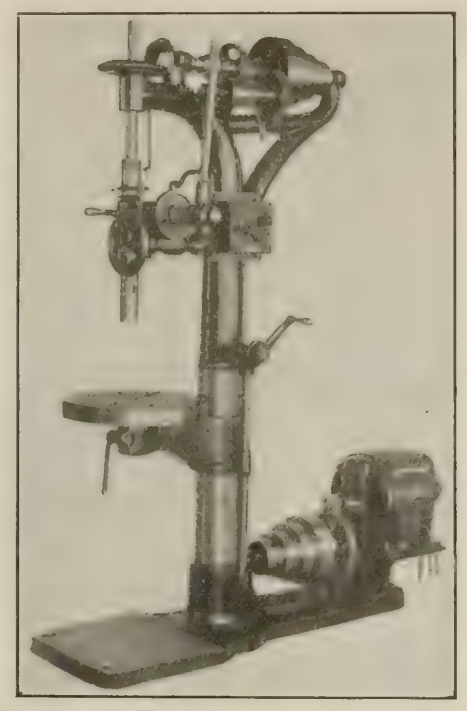
THE Rahn-Larmon Co., Cincinnati, O., are manufacturers of the electrically-driven gap lathe, shown in the accompanying illustration. It is also built for belt drive. This type lathe being particularly well adapted for repair shops, an electrical drive is desirable, aside from its inherent advantages, in that it enables location to be in an isolated part of the shop, if need be, and where transmission of power by shaft and belt, would be impracticable.

The motor, variable or constant speed type, is attached so as to conform to the general design, and power is transmitted directly to the spindle through gearing. To eliminate vibration at high speed, the motor is mounted as close to the spindle as possible, and the entire headstock, as well as the change gears, are covered, to protect the operator. Starting and stopping of the motor is controlled by a lever, mounted on the right side of the apron, and within convenient reach.

The general design of the lathe is intended to ensure rigidity, with simple construction. The extension bed top, can be adjusted to any width of gap, within the range of the machine, by means of the handwheel on the right, operating a screw of coarse pitch. Both main and top beds are extra heavy, and the sliding bed is accurately planed and fitted, thus ensuring accuracy of alignment, between spindles and carriage for all positions. The spindle is hollow, and made of special carbon steel. The boxes are made of best gun metal, and provided with means for taking up wear. The carrage is gibbed to the bed, both front and back, and has a long continuous bed bearing.

In using cross-feeds, the carriage, which may be firmly locked, is so arranged that the tool-rest can be brought close up to the gap when necessary. The front of the carriage has an extension, firmly braced, as shown, thereby allowing extra travel for the tool-rest, so that the tool may operate on the largest diameter capable of being swung in the gap. The apron is simple in design, and all gears, including the rack, are of steel. The stud pins are hardened and ground. A large range of longitudinal and cross-feeds are obtained by shifting the change gear lever attached to the feed-box; further, the feeds are so arranged, that no two can be thrown into operation simultaneously. A safety device prevents breaking of the feed-box or apron gears, either through accident or carelessness. The compound rest and cross-feed screws have graduated micrometer disks.

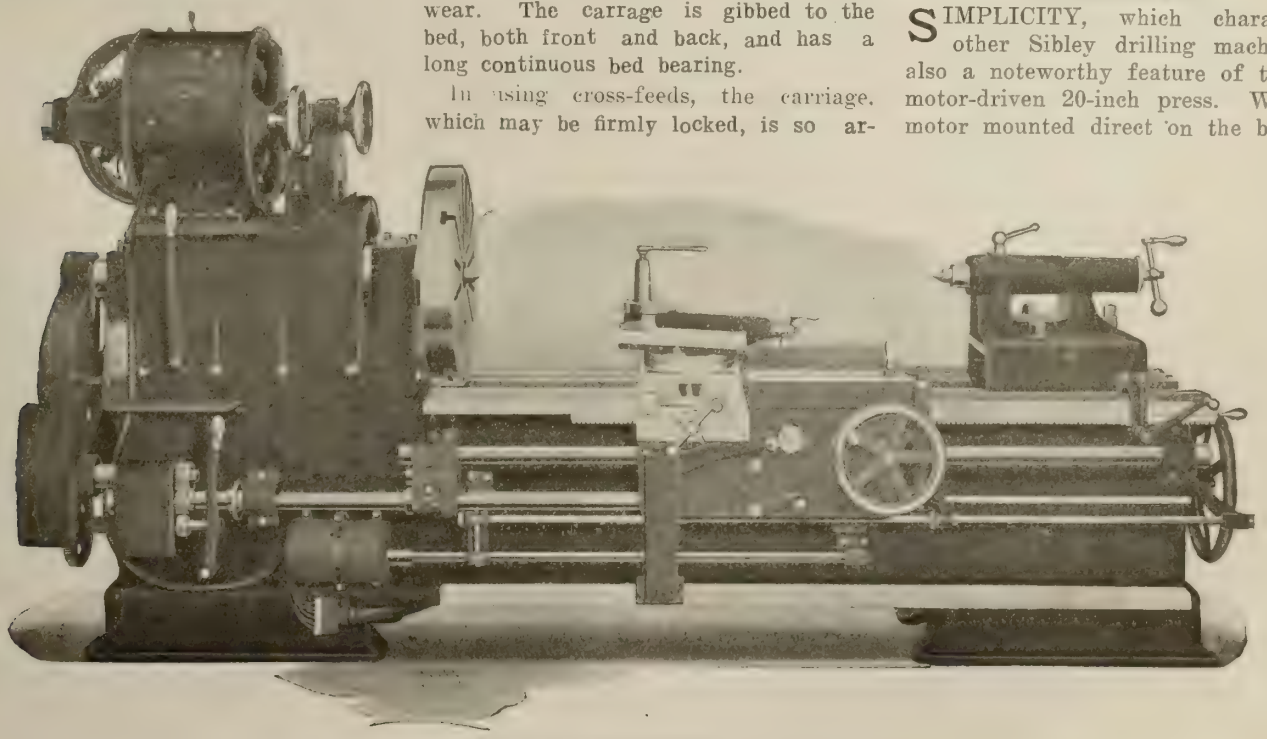
The equipment regularly furnished with this lathe includes countershaft, steady rest, follow-rest, large and small face plates, wrenches, and a full set of change gears. Additional equipment, furnished as an extra, consists of taper attachment, extension turning rest, turret on carriage, chucks, turning tools, face plate chuck, or special tool-rest. The lathe has a swing, when in the closed position of 27 inches, and 48 inches through the gap.



Sibley Motor Driven Drilling Machine.

SIBLEY MOTOR-DRIVEN DRILLING MACHINE.

SIMPLICITY, which characterizes other Sibley drilling machines, is also a noteworthy feature of this new motor-driven 20-inch press. With the motor mounted direct on the base and



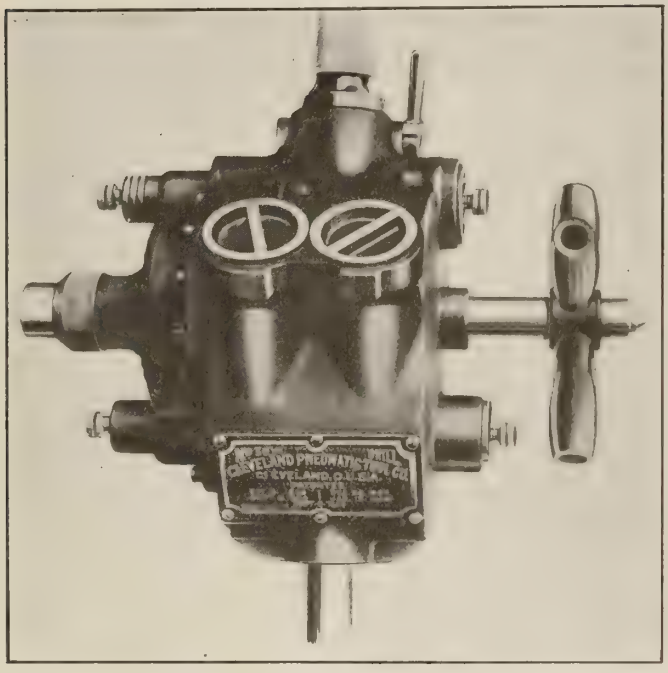
Rahn-Larmon Motor Driven Gap Lathe.

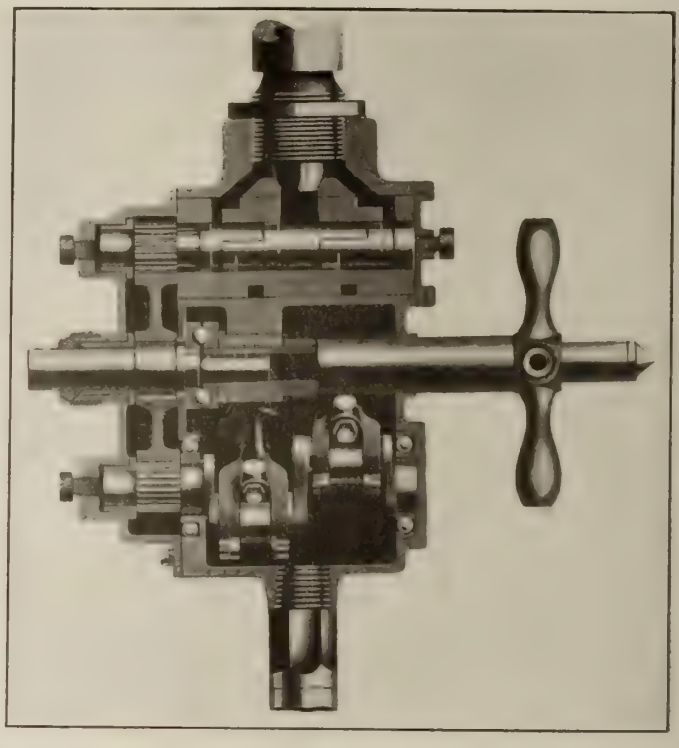
driven through gears, the weight is kept down low, thereby adding to the general stability.

Substantial design and generous proportion of working parts is a feature throughout. A 9-inch driving pulley on the 20-inch and a 10-inch on the 22½-inch drill, carrying a 2¾-inch belt, together with large cones and back gears of about 4 to 1 ratio, and 2 to 1 driving gears, deliver ample power to the spindle. The feed worm gear is driven by a steel worm running in an oil bath, which insures constant and thorough lubrication to these vital parts. The steel feed lever is light enough for sensitive, quick drilling, and at the same time strong enough for heavy work. Changing from lever to wheel feed is effected by a slight twist of the lever, and both feeds are independent of one another. An adjustable automatic stop collar on spindle sleeve trips a latch which releases the worm box lever, and the entire mechanism swings away from the worm gear on a hinge pin. A means of taking up the wear on the worm or worm gear is provided by this worm box lever.

The vertical feed shaft is driven by a worm gear and worm, running in oil, the latter deriving its power from the top shaft through cone pulleys. There is practically no spring between the head and table arm, both parts being designed strong enough for heavier work than the capacity of this press. Particular care is given to the matter of finish, the spindle and sleeve being ground, some parts polished and all rough places painted with egg-shell enamel. These machines are built with and without back gears or power feed, geared or belted motor drive, reversing countershaft or geared tapping attachment.

The weight of the machines is 650 and 900 pounds, and their floor space 17 by 45 inches, and 18 by 48 inches, respectively.



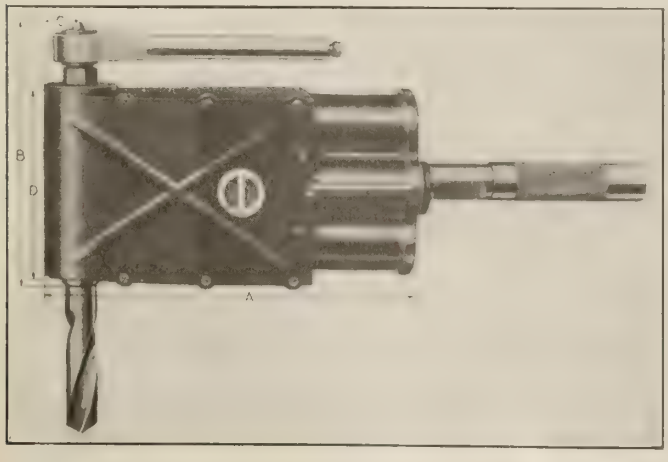


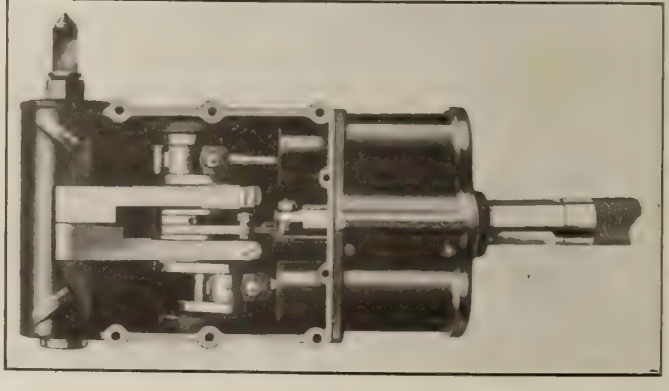
Cleveland 4-Piston Air Drill.

CLEVELAND FOUR PISTON AIR DRILL.

THE Cleveland Pneumatic Tool Co., Cleveland, Ohio, have recently placed on the market, an improved type of four piston air drill, which embodies several new features of interest to mechanics. Fig. 1, is an exterior view, showing a one piece body and lever reverse It is made with throttle handle reverse, or non-reversible as desired. Fig. 2, shows an interior view of the machine.

The dominant feature of this new drill is the mounting of the crank shaft upon annular ball bearings of the silent type, in lieu of the plain bronze bearings previously used in drills of this class.





Cleveland Corner Drill.

These new bearings practically eliminate all friction and wear, prevent heating, and maintain the driving crank in a fixed position, thereby eliminating lateral motion which is so detrimental to pinions and large gears.

The valve of rotary duplex type, is placed between, and equi-distant from each vertical set of cylinders, and being gear driven, supplies air power automatically to each set of cylinders without variation. The body is a one piece steel casting, provided with hand holes, through which access is had to the crank and connections. The pistons are secured to the connecting rods, by a ball and socket joint, which allows of universal motion, adjustment of wear,

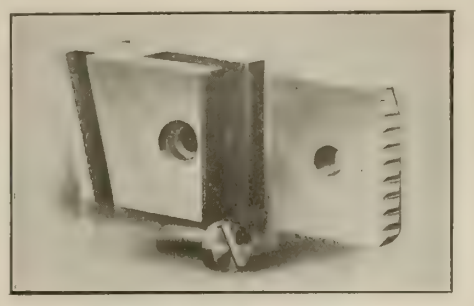


The National die sharpener.

or renewal of individual parts. The gears are enclosed in an individual chamber, separated from that of the crank by an aluminum shield plate, which protects them from accident, and admits of separate and permanent lubrication.

CLEVELAND CORNER DRILL.

Fig. 1, shows an exterior view of the Cleveland Corner Drill, for close quarters drilling. The machine is designed to drill or ream, within one and one eighth



National interchangeable case die.

inches of a side wall or corner. Fig. 2, shows the interior construction.

The motor consists of two double acting pistons, coupled to a crank shaft mounted upon annular ball bearings. Eccentric discs connect by eccentric straps to two piston valves, which control one cylinder each. Power is transmitted to the spindle, by ratchet arms connected to opposite wrists of the driving crank, their opposite ends alternately engaging ratchet teeth cut on the spindle.

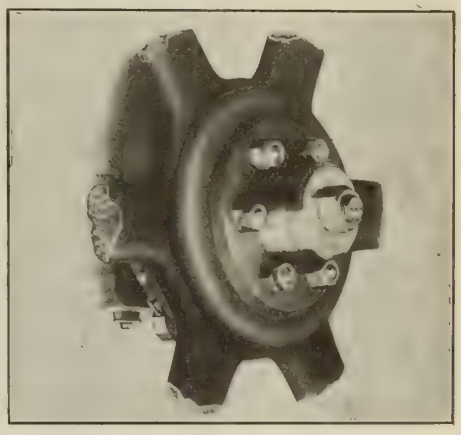
The body of the machine is a single piece steel casting, with piston and valve cylinders cast integral, a method of construction which ensures perfect alignment of working parts. Large hand holes conveniently placed, facilitate access to all working parts for adjustment and lubrication.

A NEW BOLT HEADER.

THE National Machinery Co., Tiffin, Ohio, are makers of the National Wedge Grip Bolt Header, which we here illustrate. It is claimed that the wedge gripping mechanism ensures long life to the dies, and causes a minimum loss of time for die changing and re-dressing. The grip relief is automatic, being another feature which makes for continuity of operation. The friction slip flywheel is also a noteworthy feature. If cold or excess metal stalls the machine, and prevents the heading tool from completing its full stroke, this friction-slip flywheel relieves the machine by dissipating its momentum through the slipping action, instead of throwing the entire strain on the shaft, bearings and machine generally. The motor is, of course, also protected by this equipment.

MOTOR DRIVEN QUADRUPLE BOLT CUTTER.

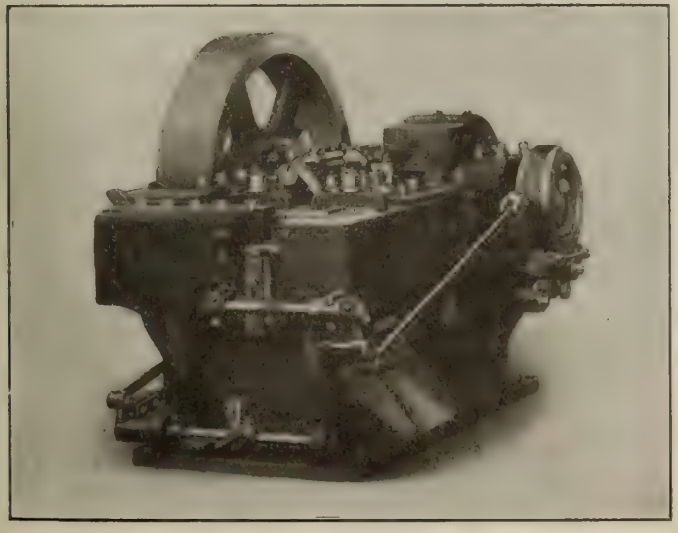
Another machine built by the National Machinery Co. is the quadruple bolt



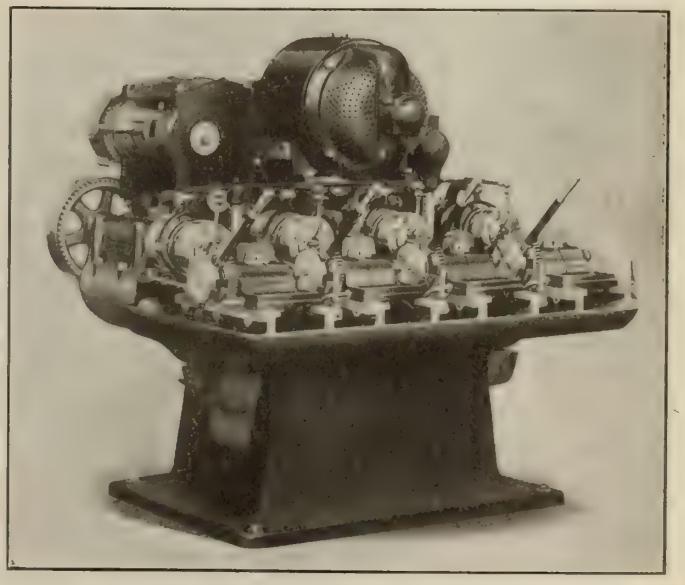
The National friction-slip fly wheel.

cutter, driven by a standard type constant speed motor, either A.C. or D.C.

The motor does not overhang, therefore a minimum of floor space is occu-



The National wedge grip bolt header.



Motor-driven quadruple bolt header.

pied. When desired, the spindles can be run independently, and there is a patented speed change device, which gives four speeds by direct gearing. The dies are held in interchangeable cases, and have a long cutting face, allowing more sharpenings than usual with hob-bed threading dies. The machine is quite rigid, and will cut an accurate thread under all conditions of diameter variation, or hardness of stock cut.

DIE SHARPENER.

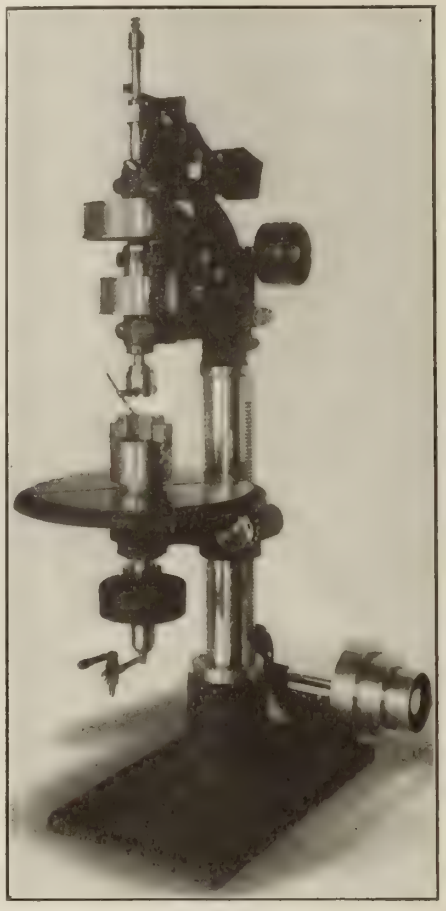
The National Machinery Co., also make the die sharpener, illustrated. This grinder is rapid in operation, and is claimed to equal the work of four men on hand grinding. It is designed to secure the correct throat or entrance, with proper clearance on each die, and grinds all dies in a set to equal depth, so that each will do its full share of cutting. This accuracy makes for the highest posible die service, prolongs their life, and results in a better qualty thread.

GARVIN NO. 2A AUTOMATIC TAPPING MACHINE.

THE Garvin Machine Co., New York City have added two more automatic tapping machines to their line, one of which is an extra capacity, to their present No. 2. This new machine will operate from $\frac{1}{4}$ to $\frac{7}{8}$ inch U.S.S. taps in cast iron, from $\frac{1}{4}$ to $\frac{3}{4}$ inch in steel, for $\frac{1}{2}$ inch pipe taps in cast iron, and $\frac{3}{8}$ inch pipe taps in steel.

The other machine, No. 2 back geared, has a capacity from $\frac{1}{2}$ to $1\frac{1}{4}$ inches in cast iron, $\frac{1}{2}$ to 1 inch in steel, for $\frac{3}{4}$ inch pipe taps in cast iron, and $\frac{1}{2}$ inch pipe taps in steel. The machine illustrated, is the No. 2 extra capacity, equipped with a special chucking arrangement mounted on the table, consisting of a Garvin automatic wrenchless two-jaw chuck, operated by compressed air. This feature adds greatly to the productive capacity, as no time is lost in clamping and unclamping the parts being operated. A turn of the air-valve, opens the chuck jaws instantly, while a turn of the valve in the opposite direction, causes the jaws to grip the work securely, and ready for the tap. This is started for a couple of threads, by the hand lever, no further attention being required. The tap goes to the bottom of the hole, trips off, and returns automatically.

The spindle is fitted with two friction pulleys, driven in opposite directions by one continuous belt, and between these pulleys is placed a friction clutch, keyed to the spindle. The friction clutch is connected with a lever at the right, by a toggle arrangement, and adjustable for the desired tension, so that an extra safety device to prevent breaking of taps becomes unnecessary. The tap is started by the lever at the right, and tripped and reversed automatically, at



Garvin No. 2A Automatic Tapping Machine.

any point by an adjustable screw stop on the upper end of the spindle, striking the tripping lever on the top of the machine.

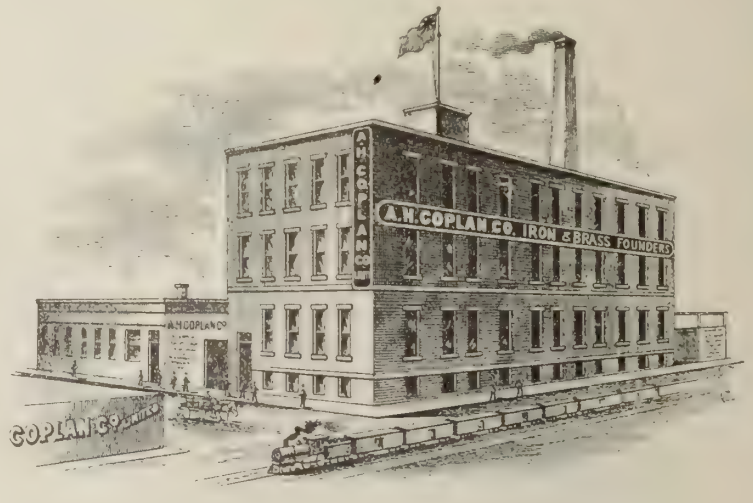
The spindle is balanced, and fitted with a positive drive chuck for holding the taps. The table is surrounded by an oil-groove, and is adjustable up and down on the column to suit the work.

The valuable feature of this tool, is that it operates satisfactorily at high speeds, and will trip and reverse after being set, though the operator should continue to press down on the starting lever.

THE A. H. COPLAN CO., LIMITED, OTTAWA, ONT.

The A. H. Coplan Co., Ottawa, Ont., have recently enlarged their works with a view to carrying on more extensively their brass and white iron foundry business. In addition to increased warehouse capacity, the brass foundry has been enlarged and equipped with the latest in oil melting furnaces by Francis Hyde & Co., Montreal. Pending the erection of their new iron foundry, the company have leased another foundry, with which to supplement their output, and keep pace with the orders being daily received and on hand. The dimensions of the present completed extension are 99 by 33 feet, and the accompanying cut gives some general idea meantime, of the plant as a whole.

The brand of white iron manufactured has established a reputation for itself at the Canada Cement Co. mills, and while embodying the useful features of semi-steel and malleable cast iron, it is, lower in cost. Orders amounting to between four and five tons of various alloys of brass, phosphor-bronze, aluminum, etc., are at present being filled. The company has been in business for about nine years, and is at present employing some 75 men. Their metal patternmaking department is another prominent feature, one of the specialities being match plates; while in wood patternmaking, a general business is done.



Mr. A. H. Coplan, who is quite a young man, devotes close attention to the management of the various branches of what has now become an important and successful undertaking.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor on us by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. VII. September, 1911 No. 9

SELF IMPROVEMENT.

BEFORE another issue of Canadian Machinery comes into the readers' hands, the season during which opportunity is given for self-improvement will have again come around. We are desirous of helping in this work, and in addition to the continuation drawing and sketching lesson every month, we purpose, with the co-operation of our readers, increasing the scope of that section of our paper devoted to "Methods and Devices."

It needs to be pointed out that contributions to that department are not expected to be strictly new creations. To many, perhaps, some or all of the ideas that appear from time to time are more or less familiar daily practice. While this is so, it should be realized that to the majority of our readers there is much that is absolutely new, and for which they look greedily, we might say each month. Men located in our large, well-equipped manufacturing and railroad machine shops, do not sufficiently realize how much they owe to the slow yet certain development of improved methods and devices by operators here and there among the general body of employes. They do not realize that small and medium size machine shops scattered all over this wide Dominion have in their employ men who are thirsting to know what the big fellows are doing and how they do them. Again, these employes of the large shops may learn much from the smaller, because, often as not, the very smallness and paucity of equipment demands ingenuity of the highest grade.

Reciprocity is in the air; as a matter of fact, it is all-pervading just at the moment, and while its adoption by Canada and the United States may or may not be a boon to either or both, there is no question as to its value between employes working in variously equipped plants. Canadian Machinery reaches the whole field, and provides the barter ground on which ideas are traded; therefore we suggest, as a truly instructive and educative programme that our readers set themselves ploddingly and enthusiastically to the task of contributing periodically brief articles covering some of the hundred and one "kinks" which ingenuity provides for the better production and quicker output of work under any circumstance. The time so spent will bring its sure and natural reward.

1911 CANADIAN NATIONAL EXHIBITION.

THE Canadian National Exhibition at Toronto is now in full swing, and judging from impressions formed of the opening days' achievements, it bids fair to eclipse all previous records. The machinery hall, in which, of course, are or should be found exhibits worthy of Canada's development in the mechanical field, is filled to the "crowding-out" point, yet numerous firms who should be showing their manufactures, are not in evidence.

We unhesitatingly affirm that due regard is not being paid to the requirements of those whose product belongs to this section, and while report has it that a remedy will be provided by increased and more specialized accommodation in another year, no time should be lost in giving absolute confirmation, if such be the intention, and in getting details into shape. Machinery manufacturers, we know, desire this opportunity of displaying their product, but for the most part are handicapped by the want of a setting through which it will be given justice. Modern factory design and layout is in many cases infinitely superior for the display of the finished machine than the present exhibition hall, therefore, it is only natural that much material is withheld on that account.

Machinery enters so largely into the opening up of our country and interests so large a proportion of its population that no valid excuse exists for its longer occupying so insignificant a department in Canada's National and Annual Exhibition.

LABOR DAY.

THE Festival Day of Labor falls to be celebrated in the Dominion of Canada on Monday, September 4th, and the bearing of some part in its fitting recognition is more or less incumbent on all. Most of us are born with the heritage which calls to labor, therefore we can and should join heartily in the enjoyment of a day when work is laid aside in favor of the pleasure which its rewards bring.

Labor Day as an institution is growing in favor, that finely drawn distinction which sought to confine its scope and ignore its universality of application, being clearly in process of complete disappearance. We believe that this new attitude inspires increased reasonableness and conciliatory measures to assert themselves on occasions of trade and business troubles.

These latter are bound to appear periodically, arising as they do to a large extent, from civil, educative and industrial progress, and our main concern should be not only a smoothing of the transition process, but a promulgation of such schemes and methods as will easily and quickly dissipate friction.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

CHEMISTRY IN THE FOUNDRY.

By S. B. Chadsey, Toronto.

IT would appear almost unnecessary to discuss this well-known subject, the theme of so many articles in the technical press during the last 10 years, were it not for the fact that there are still many foundrymen who underestimate, just as there are perhaps a few who overestimate, the value of the service that chemistry has rendered and is rendering to their industry.

Those who underestimate its value include the many who have never given it a trial, and some few of those who have. Of these two classes, the latter are the most difficult to persuade.

Foundry Chemistry Failures.

Foundrymen are to be met with who claim to have made the attempt to avail themselves of chemical methods, and which to them have produced negative or disastrous results. That is to say, they have either found no especial benefit accruing, or have encountered serious losses as a consequence. In cases of this nature that have come under the writer's personal observation, the failure has been invariably due to some misconception on the part of the chemist. Some have merely failed to observe any perchance benefit, others have made only a brief trial, and others again have had an analysis of their material made at infrequent and irregular intervals, but having no very clear idea of the significance of the results submitted to them, simply passed these over, with but slight attention.

Such courses of action and methods invariably fail, whatever the object of their application, therefore, further comment is needless.

Causes of Chemistry Failures.

Cases of positive and perhaps serious loss, due to chemistry, so called, are usually, if not always, caused by failure to realize that chemistry is only an aid to efficient foundry management, and that it can only be of value when used by someone who is thoroughly conversant with good foundry practice. Instances are undoubtedly on record where inexperienced analysts have been called upon to take charge of foundry operations for which they were not prepared, and these have frequently produced disastrous results. In all such circumstances, however, the fault has been chargeable to the management, whose failure to appreciate the true value of things, began with an exaggerated opinion of scientific methods, and ended in their wholesale condemnation. Neither position is the correct one. In a recent publication by Edward Kirk, it is somewhat surprising to find statements such as the following: — "About the year 1900 the American and various local foundrymen's associations took the matter up, and every opportunity was afforded chemists to make foundry chemistry a success. That the results obtained from these opportunities afforded, have been a disappointment to the founder is undisputed, for castings, made from anthracite and coke smelted iron, possess no greater transverse or tensile strength than those made before chemistry was introduced; and work is cast with no more certainty as to hardness, softness or strength of casting than was formerly done by fracture indications." — "The writer's attention was recently called to a mixture made by a practical foundry chemist in charge of a foundry. These five ingredients, silicon, sulphur, phosphorus, manganese and carbon, were determined, and a mixture made by analysis for soft castings, yet all of the latter were found too hard to be machined. Investigation showed that a new brand of iron placed in the mixture contained titanium in sufficient quantity to harden the whole combination."



S. B. CHADSEY

Canadian Representative, American Foundrymens' Association.

These statements are entirely misleading, and it is unfortunate that they should be made, evidently on insufficient data, by one whose name carries some weight with many foundrymen.

Practical Services of Chemistry.

In commenting upon them, we desire merely to express the main practical daily services of chemistry to the modern foundry. They are, we believe, as follows.

I.—The definite and certain regulation of foundry irons, so that the metal for every cast, shall be of the desired grade. It is readily possible, to produce at every cast, iron required for the work on hand, if suitable raw materials are provided and the melting practice is good. If soft iron is required, there is no reason why soft iron of a particular grade should not be always forthcoming. Such regularity, however, can only be secured through the agency of chemical analysis.

II.—The investigation of the details of melting practice, all of which are dependent upon chemical laws.

III.—The additional aid afforded by chemistry, in determining the causes of variable conditions, wherever they occur in connection with the casting process, and the greater consequent facility, with which conditions may be standardized.

To attain these results, it is necessary that chemical work should be regularly and systematically pursued, and through either private or commercial laboratories, this privilege and advantage is made available to practically every foundry, whatever its capacity or value of output.

DEFECTS IN SMALL CASTINGS.

By John H. Eastham, Montreal .

Those castings which make the average foundryman grey-headed before his time, do not usually weigh several tons each, but are rather those of the small variety, ordered in large quantities, and in many cases of the plainest design. The writer, in quoting a case in point, may therefore, perhaps be pardoned for treating the somewhat hackneyed subjects of proper gating and venting.

An English firm of cotton machinery makers required several thousands of small collars or bushes annually, of type shown in sketches of pattern plate, Figs. 1 and 2. These collars were of various sizes, the heaviest weighing about 8 pounds. They were polished absolutely clean and bright, and were in all cases mounted on cast iron pattern plates, about $\frac{3}{8}$ inch thick. The boxes employed were 18 by 12 inches, provided with a guide pin at each end, one round and one square, to avoid mistakes in closing, when in use on ordinary hand rammed turnover machines. A wedge

driven in at each end, between pin and cope part, sufficed to hold down the molds when cast. The facing sand used for small work in this particular foundry, was ground fine in a heavy mill to facilitate drawing patterns, and secure

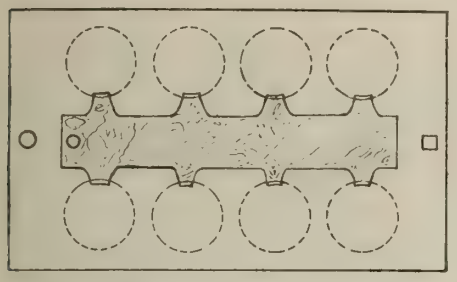


Fig. 1.—Defects in Small Castings.

perfect lifts, in most cases without the aid of gaggers. The collars in question, when first mounted on pattern plates, were gated in the drag part, an ordinary spray runner being fixed to the under side of plate.

Faulty Castings and Their Remedy.

For some time, the number of faulty castings discovered in the lathe, was quite 15 per cent. Changes of mixture, hotter metal, and careful skimming having no effect, the foreman decided to try a heavy runner, of type shown in sketches, fixed to the cope side of the plate, the sprays overlapping each casting about $\frac{1}{8}$ of an inch. This had the effect of removing the sponginess and dirt previously encountered, but a new disease developed, in the shape of minute blowholes around the top of each casting.

Free use of the vent wire and of ordinary floor sand on face of cope parts being of no avail, the foreman came to the conclusion that gas from under the heavy runner found its point of least resistance in the molds just before each casting was quite full, and decided to attach strips of lead to the drag side of the plate between the castings, extending

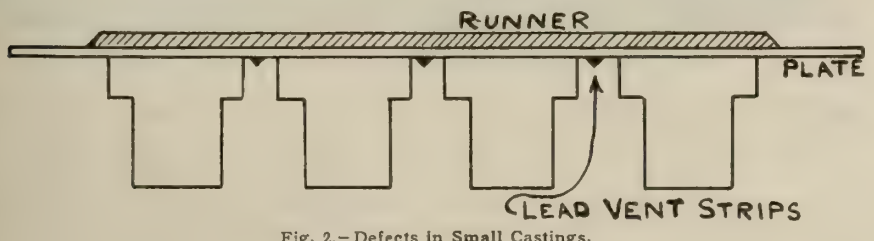


Fig. 2.—Defects in Small Castings.

almost from the top runner right to the box edge.

The loss was brought down to about one per cent., showing that the result justified the experiment. Since then, the vent wire has been ignored on this particular job, to the satisfaction of both molder and employer; all plate and machine jobs in the shop being rated on a piecework basis, a fair price being paid for good castings only.

TYPES of FOUNDRY CONSTRUCTION.

By George K. Hooper.*

I am somewhat opposed to reinforced concrete for foundry construction, on account of what might be termed, "manufacturing elasticity," because it does not adapt itself too well to the alterations and extensions which are constantly being made in plants devoted to foundry work. Brick, concrete blocks, and hollow tile are the most adaptable, brick probably being more so than any of the others, and considering the present price of brick, no saving can be effected by the use of the other two forms of covering, although in large foundries, the weights of steel can be maintained at the minimum, by the use of hollow tile above the windows.

While I have always furnished plans to reinforced concrete contractors, that they might compete with other forms of construction, I have not yet been able to secure a bid as low, or to have as cheap a building as that from other materials. When I say this, I give due appreciation to the question of insurance, locality and contents being considered by the underwriters, as well as the type of the building.

For interior partitions, hollow tile makes a firm, cheap wall. Concrete plaster on wire laths, expanded metal, or galvanized netting, usually requires so much supporting steel, that it is quite expensive, and practically costs more than tile, while not possessing the advantages of the latter. Steel roof trusses should be carefully designed so as to be conveniently reached with cleaning and paint brushes; this more especially in foundries of the continuous type, where considerable vapor arises from the cooling sand. The trusses and columns should be carefully and thoroughly painted.

Windows, except where there is an exposure, are generally made with wooden frames, glazed with factory ribbed glass, and should be fitted to tilt, in order to secure the greatest possible opening. There was at one time, a craze for making walls almost entirely of glass and steel. Such buildings, however, are difficult to heat in winter and to ventilate in summer, while the glare of the direct sunlight is most unpleasant. Many plants of this kind have adjusted curtains to the windows, or painted over portions of them and in some cases large sections of glass have been removed. A building wall containing 50 per cent. of window space, will usually be very completely lighted for any width of structure, and in any event, passages and storage departments can be placed in the darker sections.

I am an advocate of metallic bars and ribbed glass for skylights, and in continuous foundries where a large amount of vapor is present, a copper bar is cheapest in the end.

*The Hooper-Falkenau Engineering Co., New York.

THE DETROIT CORE MACHINE.

The illustrations, Figs. 1 and 2, represent the Detroit Core Machine jar-ramming and rolling-over a large core by means of a clamp held with one hand respectively. The core room, of all departments in the foundry has been most neglected, and why this should be so, we are at a loss to understand. Money



Fig. 2.—The Detroit Core Machine, Rolling Over a Large Core.

may be and is lost there just as surely as in other sections, and a jar-rammed core has everything to recommend it as against one which is hand rammed.

A smooth uniform core is assured, eliminating hard and soft spots which often as not result in blowing and rough castings. A feature of this Detroit core machine is the fact that the core-maker works right at his bench, and stands right in his tracks to make his core, thereby saving much time and labor running around. The machine occupies small space, a consideration always of importance, and particularly if the core-room is crowded. The core box is easily drawn by means of the foot power device, giving a firm steady motion and obviating patching.

Fig. 2 represents a coremaker rolling-over a box with one hand, which on the bench would require two men to roll over. The box in question is 26 inches long, 16 inches wide, and 6 inches deep. The machine is equally adaptable for handling several small jobs at one time, and in this feature, its attractiveness as



Fig. 1.—The Detroit Core Machine, Jar Ramming a Large Core.

a time and labor saver is perhaps more apparent, because any number of cores up to its capacity may be negotiated in the time that one usually takes otherwise. The makers are the Detroit Core Machine Co., Detroit, Mich.

A GRAVITY CARRIER.

THE Canadian Mathews Gravity Carrier Company, 312 Stair Building, Toronto, incorporated with a capital stock of $100,000, has opened a factory at 28 Sheppard street, Toronto. The company holds numerous patents covering ball-bearing gravity carriers, spiral chutes, automatic elevators, etc. Gravity carrier systems have a wide range of usefulness as applied to the handling of such merchandise, as brewery cases, boxed goods, shingles, lumber, barrels, cooperage stock, pig iron, and other commodities, having one or more flat surfaces, which allow them to move forward of their own weight, on a carrier line adjusted to a slight grade

This carrier was introduced by the Mathews Gravity Carrier Co., St. Paul, Minn., about six years ago, and has been highly successful.

The officers of the Canadian company are:—H. L. Jenkins, president, Vancouver, B.C.; F. E. Moore, vice-president; O. C. Sylvester, treasurer and managing director.

The half tone shows the gravity carrier in use, unloading cooperage stock from a box car. The rollers consist of seamless steel tubing, running on two ball bearings. A straight line and portion of a curve is also shown. The latter being reversible, to permit of stock delivery in either direction. The straight line portions are made up in standard lengths of 8 feet, one of which may be seen against the side of the car.



The Mathews gravity carrier.

MECHANICAL DRAWING AND SKETCHING FOR MACHINISTS.*

By B. P.

IN our last lesson, we showed how one view of an object is obtained from another by straight line projection. We will now apply the principle, in drawing the three views of a common hexagon nut. Drawing a hexagon nut, involves the use of a 60 degree set square, and when the student can draw a hexagon with one of its points at any angle, in relation to vertical or horizontal centre line, he will realise more fully than many a column description would teach him, the numerous uses to which set squares can be put.

Drawing a Hexagon Nut.

A hexagon nut is frequently made of the following proportions, If we call the diameter of the bolt, D, the nut will have a width across the flats of $1\frac{1}{2}$ D + $\frac{1}{8}$ inch, and a height equal to D. Thus a nut for an $1\frac{1}{4}$ inch bolt will be $1\frac{1}{4}$ plus $\frac{5}{8}$ plus $\frac{1}{8}$, or two inches across the flats, and $1\frac{1}{4}$ inches high.

Fig. 1 shows how to draw such a nut. Commencing with the plan view, draw two centre lines at right angles to each other. With their point of intersection as centre, describe a circle whose ra-

*Seventh of a series of an instruction course.

dius will equal half the diameter of the bolt, or $\frac{5}{8}$ inch. Next describe from the same centre, a circle equal to the width of the nut across the flats. In this case the width is 2 inches, therefore the compasses are set to a radius of 1 inch.

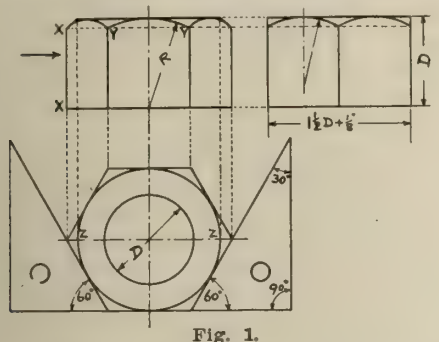


Fig. 1.

Now, take the 60 degree set square as shown, and draw lines tangent to this circle on each side, turn the set square over and draw two others. This gives four sides of the nut, the remaining two being got with the tee square. From this plan, the elevation above it, (which shows the nut from corner to corner), will be projected. Four corners, and three faces of the nut are seen, the middle face only being true width. The other two appear narrower, because they are inclined at 60 degrees to the vertical plane, on which the elevation is projected. The view to the right hand is in the direction of the arrow, and shows three lines, that in the centre being for the edge XX. The other two lines are the outer faces, their distance on either side of the centre line, being measured from the plan view.

The 2 inch circle in the plan shows that the corners are turned-off or "chamfered," the upper views showing that this turning-off is at an angle with the centre line. In the elevation, this is shown by the line YY, drawn from the centre of the bottom of the nut with a radius R, equal to its thickness, or in this case $1\frac{1}{4}$ inches. This face shows the true form of the curve, while the two others, being inclined, appear as small portions of an ellipse. Since they differ very little, however, from true arcs of circles they are in practice always drawn as such.

The nut is flat on the top from Z to Z, (see plan), and the figure shows how these points are projected up to the elevation, and a line drawn tangent to the arcs on each side. The end view presents no difficulties, its construction being clearly indicated.

Methods of Using Set Squares.

Fig. 2 shows the method of drawing a hexagon with one corner at various angles with the horizontal, and forms a good exercise in the use of set squares. The figure also shows how to construct an angle of 15 degrees. The student should draw these exercises until thoroughly familiar with the method employed, as the necessity for their application constantly occurs.

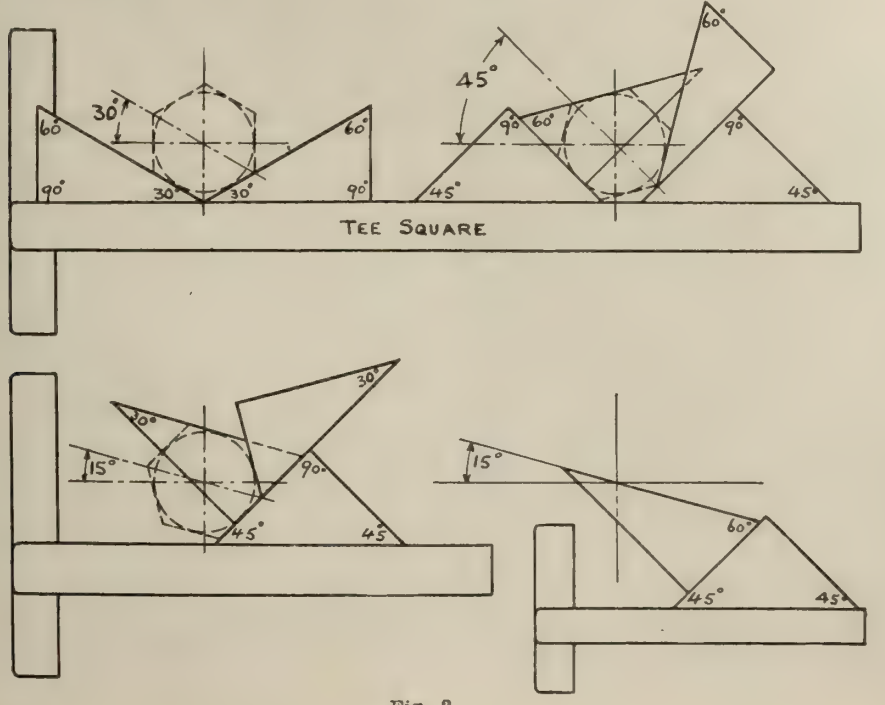


Fig. 2.

Practical Examples.

Fig. 3 shows good proportions for an ordinary spanner. The thickness and breadth of the shank are shown expressed in terms of the width of the nut A; but these are not necessarily rigidly adhered to. For instance, if A is 1 1-16 inch, we will find that $\frac{5}{8}$ A plus $\frac{3}{8}$ inch, works out to about 1 1-32 inch. This in actual practice would be made 1 inch or 1 1-16 inches. The thickness of the head of the spanner is usually made equal to D, the diameter of the bolt.

In making the drawing, we first construct a hexagon in light dotted lines to represent the nut, this can afterwards be erased, if desired. Through the back, top and bottom corners of the hexagon drop a vertical dotted line as shown. This line will cut the circle which touches the sides of the nut at two points B and C. Join the centre of the nut O to each of the points B, C, and continue the lines to D and E. Set the needle point of the compass at B, and the pencil point at the top outer corner of the nut; this radius is shown as r in figure 3. With B as centre and r as radius, describe an arc from the top outer corner of the nut, as far as the line O B D —the point D being where the two lines intersect. Repeat this operation from C as a centre.

Next set the needle point of compasses at O, and pencil point at D. With this radius, shown in the figure as R, join up the two arcs already drawn.

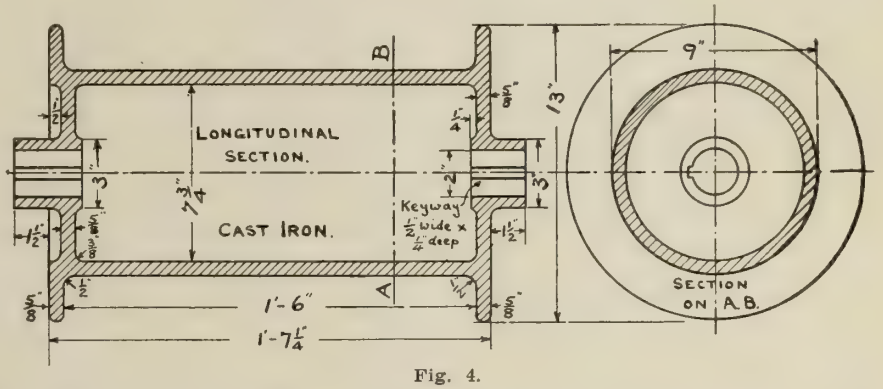


Fig. 4.

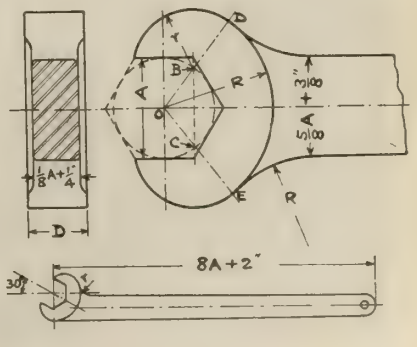


Fig. 3.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

The Artificial Lighting of a Factory Location

This Article Goes to Show the Benefits Derivable From a Well-lighted Machine Shop, With Respect to Quality and Quantity of Output, the Spirit and Enthusiasm of the Men, and the Possibility of Accomplishing These Results on an Early Repayable Outlay, at Minimum Operating Cost of Renewals, Under Circumstances Where Vibration is of Sufficient Importance to be Accounted.

By E. R. Treverton.

AMONG the reports on lighting installations, that have appeared in the past months, comparatively few deal with the question of lighting the rougher locations, such as machine shops, mills, factories and the like, due to the fact, no doubt, that little has been done along this line, or that those conducting the work, have little time to report on it. It is the object of this article, to describe how a very dark machine shop was lighted by a simple, but effective method, which gave entire satisfaction to all concerned.

Machine Shop Description.

The location in question is a typical inside factory one, consisting of an aisle 40 feet wide, situated between two other aisles of slightly greater width, and separated from them only by the columns that carry the roof. Four hundred feet of this aisle is used for general machine (mostly lathe) work. The ceiling 12 feet high formed by the 2 x 8 inch wood floor above, is divided into 40 x 16 feet bays, by the supporting girders. A crane runs the entire length of the aisle, with a clearance of only 13 inches above the hoist. The natural lighting comes from the aisles on each side, one of these having a row of windows occupying the entire outside wall, the other making use of sky lights and a row of windows just under the roof, at a height of about 50 feet from the floor. The light from the first source was mostly cut off, by a row of high machines directly in front of the windows, and by the intervening columns, crane girders, and the like. From the other side, the windows being so high in comparison with the width of the room, only a narrow strip of the floor was directly lighted, and this imperfectly, on account of the machines located just along the edge of the aisle. It was necessary to use artificial light at all times, as under the best conditions of a bright day, the natural light was exceedingly dim, and presented a worse condition than if there had been absolute darkness, because the mixture of daylight necessitated a higher artificial intensity than would otherwise have been necessary.

The Lighting Problem Solution.

Formerly, clusters of carbon lamps scattered here and there, formed the general lighting scheme, each machine being furnished with one or more extension lamps, which were moved from place to place as the operator required. Not only was the light insufficient, but the continual transfer of lamps, with their consequent breakage and cord damage, made the maintenance cost so high, and reduced the efficiency of the workman to such an extent, in quality and quantity, that a change became absolutely necessary. It was further impossible to keep good men, on account of the inconvenience and unpleasantness of their surroundings.

The small clearance over the crane, together with the low ceiling, excluded all types of lamps except the incandescent. Carbon lamps in sufficient numbers, would have required an excessive current consumption, therefore, tungsten units were selected as being the most applicable. There was, however, some doubt as to the advisability of adopting tungsten lamps, as the floor above was used for machining heavy castings, and the constant dropping of these, it was feared, would cause a large lamp breakage, because of their being of the old fuse type. To determine the exact effect on the life of the lamps, two bays were each equipped with 8—100 watt, clear tungsten lamps, having intensive glass reflecters mounted directly on the ceiling. One inch of free cord intervened between the rosette and the socket. The lamps were arranged in two rows of four lamps each, per bay, making the spacing distance 8 x 10 feet, and the power consumption 1.25 watts per square foot of floor space. The switching was arranged so that four lamps could be operated in a group, thus permitting small areas to be lighted without waste. After several weeks operation, the breakage was found to be small, and subsequent replacement by Westinghouse Wire-Type lamps caused it to disappear altogether regardless of vibration due to cranes, and dropping heavy weights on the floor above.



Lighting a Factory Location.

Operating Results Achieved.

The illumination was uniform and of sufficient intensity for the class of work done, and the shop was transformed from a gloomy, into a cheerful location. The spirit of the men improved, as was shown by the quality of the work turned out, the floor was kept cleaner, and the whole appearance of the place changed for the better. Further, the general results were deemed so satisfactory that the entire 25 bays were similarly equip-

ped, all extension lamps being removed, except where necessary to see into deep work or under machines. For these latter purposes, plug boxes have been placed at convenient places, and extension lines used only when necessary. The general lighting scheme is therefore, never interferred with, and the place is entirely free from the mass of cord that previously characterized it.

Duration Test.

The new system has been in service for well over a year, and careful records show the cost to be not only reasonable, but that saving in quality of work, and ability to keep good men, has more than repaid the original expense.

The accompanying photograph, taken at night without any light except from the ordinary source, shows the location and gives some idea of the satisfactory character of the illumination. All parts of the room are sufficiently lighted, to permit work being done with equal ease at any point. Tests showed that the average intensity on the horizontal plane was 2.5 foot-candles, with a minimum of 1.6 foot-candles at the extreme edge of the room.

THE HOLDEN-MORGAN CO., TORONTO.

The Holden-Morgan Co. have a well-equipped modern machine shop at 50 Pearl St., Toronto, and carry on a general machinist business, in addition to making cutting, blanking and forming dies, special experimental apparatus, etc. A. P. Holden, late of the Scholfield-Holden Machine Co. is president and general manager, while Philip Morgan is vice-president and superintendent. The latter was for twelve years mechanical superintendent at the Newmarket works of the Office Specialty Co., of Toronto.

The illustration shows a corner of the machine shop, where about 25 men are now employed, as against 8, some nine months ago, when the business started.

The equipment, all new, includes engine lathes, swinging from 14 to 24 inches, built by the American Tool Works Co. and fitted with quick change speed gears; Kearney and Trecker Co.'s milling machines, both plain and universal; Becker vertical milling machine; 16 and 24 inch; McGregor-Gourlay shapers; Le Blond cutter grinder, and various miscellaneous tools, including drill presses, speed lathes, power presses, arbor presses, etc.

The shop is noticeably clean; the floor and benches are of hard wood, and dirt in every form is vigorously chased. The men are supplied with "screw-jack" stools, which have hard wood tops and cast iron bases. The work benches are lighted on the Almond system, flexible metallic tubing allowing adjustment of the lamps in any direction. The operators of the principal machines are provided with convenient stands, mounted on castors. These were made in the shop, and consist of two shelves and a drawer about two feet square. They are mounted on a frame of wrought iron pipe, and form a convenient receptacle for small tools, milling cutters, jigs, etc. There is a No. 1 American gas oven and blower for hardening, and a blowpipe equipment for brazing.



Holden-Morgan Machine Shop.

The contracts on hand, include automatic candy wrapping machines, check book presses, automatic paper bag machines, sand papering machines, paper coating machines, as well as a number of automatic jigs, fixtures and small tools.

The company intend to purchase property in the near future on which to erect a larger and still more convenient factory.

"WELFARE" WORK.

The extent to which the United States Steel Corporation is carrying on "welfare" work in its mills, is shown by an official statement, that to date in the present year, there has been spent almost $700,000 for improving the conditions under which the workmen are employed. This sum has been expended on the installation of safety appliances, the establishment of cooling systems, especially in the sheet and tin plate mills, on the erection of hospitals, improving the labor conditions in the coke regions, and on undertakings of a similar character. Appropriations, totalling in the aggregate, the above sum, have been made for these purposes from time to time during the past seven months.

NOTES ON CONSTRUCTIONAL DETAILS.

Every machine or structure is designed with a certain object in view; therefore in designing, keep that object always to the front and let it influence every thought and action. Go straight to the point and let the object be attained in as simple and direct a manner as possible. It should be remembered that machines and other structures designed in this way, with the least material for the work to be done, usually look well and cannot be improved in appearance by outward embellishments.

Parts subject to stress should have as little change in form as possible, and if change is necessary it should not be of a sudden nature; these remarks especially refer to cast-iron, where a sudden angle or opening with square corners (even if not very sharp) may cause fracture when the section might be thought more than ample. Steel castings should be as simple and as free from ribs or brackets as possible. Ribs or nerves which run lengthways are not, however, as objectionable as those across the lines of principal contraction, but the soundest of metal under such projections is often doubtful, so that they may be a source of weakness instead of strength.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

FORT WILLIAM, ONT.—The stove works of W. J. Copp, Son & Co., Fort William, Ont., is being taken over by F. W. King, London, Ont., and others. The plant will be enlarged and overhauled.

HAMILTON, ONT.—Bowes-Jamieson, Ltd., Hamilton, Ont., formerly Bowes, Jamieson & Co., will enlarge its plant after the first of the year, and the capacity of the foundry will be increased from 7 to 10 tons per day. Molding machines will be installed along with other equipment.

HAMILTON, ONT.—The Hamilton Foundry was damaged to the extent of $1,000 by a fire which started near one of the core ovens and burned its way through the roof.

HESPELER, ONT.—The Hall, Zryd Co., of Grimsby, who recently purchased the idle plants of the Parkin Elevator Works and the Dominion Heating and Ventilating Co., from the corporation are now preparing plans for the building of an addition to the moulding shop of the former works. It will be 37x60 feet, and when completed, will give the company a moulding shop 60x85 feet, which will comprise but a part of the immense moulding shop to be completed next season.

TORONTO, ONT.—The National Cash Register Co., Dayton, Ohio, have taken an option on ten acres in the northern part of the city, and in the spring will erect a model factory. Their present factory on Lombard Street is entirely inadequate.

DAVIDSON, SASK.—Messrs. Allen, McNeil and Brown, woodworkers, machinists and blacksmiths, commenced business here recently.

RED DEER, ALTA.—J. W. Broughton, of the Red Deer Ironworks, is contemplating the establishment of a foundry in connection with his business.

HAMILTON, ONT.—The Schacht Motor Car Co., of Cincinnati, have decided to establish a $350,000 plant here.

INGERSOLL, ONT.—An industry which promises to be a large concern, is the Fruit Machinery Co., situated a little east of Thames St., on the C.P.R. This firm came to Ingersoll a few months ago from Western New York, where factories have been established for years. Their employees come from the same section and are experts. Fruit machinery of all kinds is manufactured and the only evaporating factory machines made in Canada are turned out by this firm.

MONTREAL, QUE.—The John McDougall Caledonian Iron Works have entered upon the manufacture of plunger elevators, passenger or freight. They will be built in the company's shops on Seigneurs Street.

STRATFORD, ONT.—The Macdonald Thresher Co., Limited, with head office at Stratford, is the name of the new company which has been formed to take over and carry on the business of the Macdonald Manufacturing Co., which for many years successfully conducted the manufacture and sale of separators, traction engines and other threshing machinery in Stratford.

VANCOUVER, B.C.—The largest single shipment of saws ever made to a Western Canada mill passed through here recently. The consignment consists of ten tons of circular and board saws for the lumber mill of the Ocean Falls Co. The saws and a large consignment of electrical machinery come from Hamilton, Ont.

SWIFT CURRENT, SASK.—W. H. Hodgson has about completed the construction of a garage and machine shop here. The former is 40x50 feet, the latter 30x32 feet.

CHILLIWACK, B.C.—Thos. L. Lillie has purchased the business known as the A. J. Robertson Machine Works.

EDSON, ALTA.—The Grand Trunk Pacific will establish car and machine shops here. They will be of standard capacity.

FORT WILLIAM, ONT.—The city has been asked to enter into a deal with Messrs. Kirkpatrick and King whereby the former will guarantee the bonds by which the Copp Foundry is to be taken over and enlarged by the new company. The matter will likely be referred to the ratepayers.

MONTREAL, QUE.—The Canadian Pacific Railway has started work on another huge undertaking in connection with their Montreal transportation facilities. Out near Western Junction the company is building a new terminal headquarters, which consists of a large twenty-four stall engine house, a machine shop, a turntable, a coaling plant, a stores building, a rooming and lodging house capable of accommodating one hundred men, and a car shunting and storage yard of two thousand cars capacity. Eventually the new terminal will have a capacity of four thousand cars.

PRINCE RUPERT, B.C.—L. B. de Laitte, the prominent French inventor, is establishing a plant here to manufacture gas machines.

MUNICIPAL.

MOOSE JAW, SASK.—One of the largest enterprises of the city this year is the sewerage system. Approximately $400,000 is being spent on it.

EDMONTON, ALTA.—It is proposed to erect a civic warehouse and stables for the city. The building will cost $10,000. There will be 46 stalls in the stables, besides four loose boxes, hay loft, caretaker's room and a cook room. The warehouse will be a three-storey structure, 70 by 100, while the workshop will be a two-storey building. The ground floor will be used for stores, water and electric light shop. There will be a carpenter shop on the second storey.

Trenton

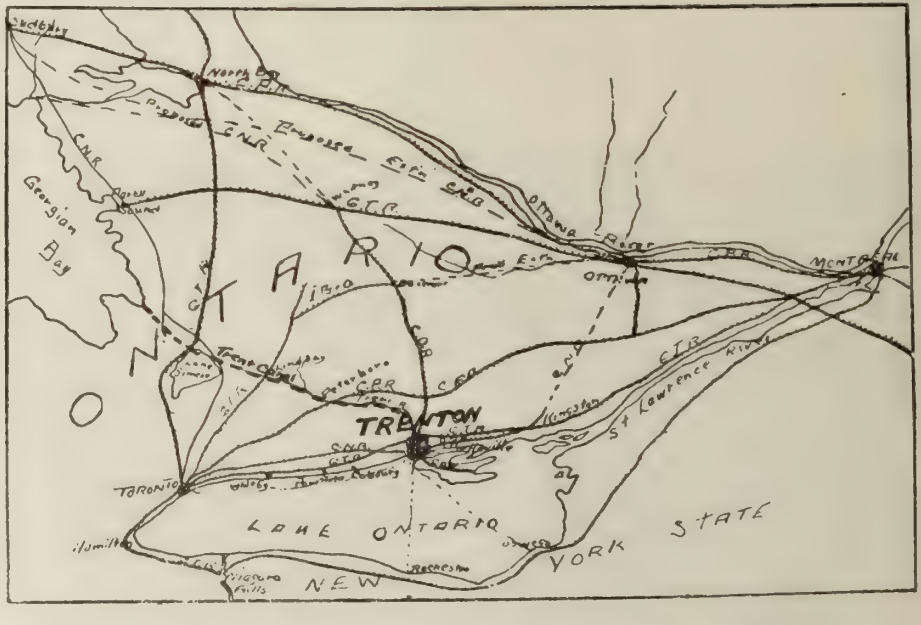
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Secretary Board of Trade, TRENTON, Ontario, Canada.

SARNIA, ONT.—The council has offered to buy out the Sarnia Gas and Electric Light Co. for $125,000.

HAMILTON, ONT.—Mr. Willis Chipman, the expert engaged to report on the waterworks system, has partly completed his report and given it to the Controllers. They have not made it public, but have stated that three of the principal recommendations made by Mr. Chipman have been anticipated. These are that a third electric pump be installed at the Beach, the placing of a new and longer intake into the lake, and the replacing of the high level pumping station with a new or improved plant. These works will cost about $115,000, and it is thought that the total waterworks improvements that may be necessary will cost about $500,000.

EDMONDS, BURNABY, B. C.—The Western Canada power by-law and the waterworks merger by-law were carried.

EDMONTON, ALTA.—The ratepayers defeated the by-law to grant a gas franchise to the International Heating and Lighting Co., Aby-law to provide for the establishment of a municipal gas plant will likely be submitted in the near future.

HIGH RIVER, ALTA.—On Sept. 5 the ratepayers will vote on a by-law to raise $125,000 for a waterworks and sewerage system.

TRENTON, ONT.—The ratepayers will on Sept. 5 vote on a by-law to raise $2,500 for sewers.

WEST LORNE, ONT.—The ratepayers defeated the waterworks by-law recently.

OAKVILLE, ONT.—The sewer by-law was carried by the voters.

SUDBURY, ONT.—The ratepayers carried by-laws totalling $146,000 recently.

MILTON, ONT.—The burgesses carried the by-law to extend the waterworks system.

CARDSTON, ALTA.—The ratepayers voted $40,000 for a gravity waterworks system.

SASKATOON, SASK.—The ratepayers passed by-laws totalling $95,000 recently.

CANORA, SASK.—By-laws totalling $91,000 for a town hall, waterworks and a sewerage system were carried.

KERRISDALE, B.C.—The ratepayers passed the by-law to spend $501,259.80 for waterworks extension.

NIAGARA FALLS, ONT.—The Muddy Run sewer by-law to raise $60,000 was defeated.

CALGARY, ALTA.—A by-law endorsing an expenditure of $20,000 for sewer purposes was carried.

CORNWALL, ONT.—The by-law to raise $30,000 for water mains was carried.

WINDSOR, ONT.—The by-law to expend $17,000 on on auto fire apparatus was defeated. The waterworks by-law for $50,000 was carried.

NANAIMO, B.C.—The ratepayers passed the $50,000 sewerage extension by-law and the B.C. Hydraulic Power Co. agreement.

STRATHCONA, ALTA.—The ratepayers recently passed the $100,000 Hospital by-law and the $10,000 new force main by-law.

MOOSE JAW, SASK.—On September 7 the city will pass on by-laws aggregating $166,000 for municipal improvements.

OTTAWA, ONT.—On Sept. 7, the voters will be asked to endorse an expenditure of $195,000 for waterworks.

GALT, ONT.—On Sept. 9 the ratepayers will vote on a by-law to expend $10,000 for waterworks purposes.

ELECTRICAL.

PRINCE RUPERT, B.C.—The work of making the surveys in connection with the plans of the Prince Rupert hydro-electric company has been going on here for some time. The programme recently adopted by the board of directors contemplates the expenditure of $600,000 during the next twelve months and $2,500,000 within the next four years. The company was recently incorporated with an authorized capital of $5,000,000. It represents a merger of the Tsimpsean Power and Light Company, and the Continental Power Company, owning exclusive water rights on the Kahtada river, forty-two miles from Prince Rupert, and at the Falls on the Exaw river, twenty-eight miles from the same city. English, French and Canadian capitalists are interested in the proposed enterprise.

The president is C. H. Cahan, K.C., of Montreal, president of the western Canada Power Co., which is developing Stave Lake Falls for supplying power to Vancouver and other points on the lower mainland. The general manager is R. F. Hayward, who occupies a similar position with the Western Canada Corporation.



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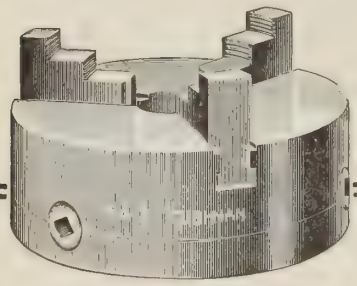
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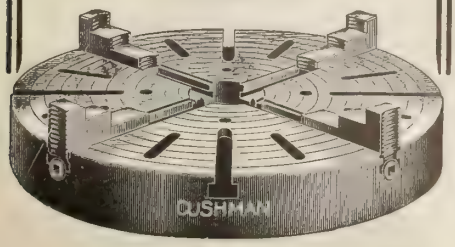
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TORONTO, ONT.—Although the filtration plant is not yet finished the controllers are planning to enlarge it, and on Jan. 1, the ratepayers will probably be asked to say whether or not, seven more filter beds will be added at a cost of $420,000.

FOSTER, QUE.—The Brome Lake Electric Light Co. are making some extensive improvements to their plant here.

VERMILION, ALTA.—The town will expend $15,000 for a municipal electric light plant.

GRIMSBY, ONT.—On Sept. 5 the ratepayers will vote on a by-law to grant a loan of $10,000 to the Radiant Electric Co.

DAVIDSON, SASK.—The ratepayers will vote on a by-law to expend $10,000 for power purposes.

INDIAN HEAD, ALTA.—The ratepayers will, on Sept. 8, vote on a by-law to provide $25,000 for extending waterworks, sewers and electric light systems.

MIMICO, ONT.—The ratepayers will vote on a by-law to expend $7,500 for a power plant. Voting will take place Sept. 16.

HAMILTON, ONT.—A by-law providing $505,160 for a municipal power plant carried recently.

NAPANEE, ONT.—The by-law authorizing the town to sell the municipal electric power plant to the Seymour Electric Co. for $40,000 was carried.

INGERSOLL, ONT.—$25,000 will be spent on improvements to the electric light plant here.

PORT STANLEY, ONT.—A by-law was passed whereby the town will purchase Mitchell's electric light plant and install a Hydro-Electric power and light plant.

MIDDLETON, N.S.—The contract to install the electric light plant here was given to the Canadian General Electric Co. for $4,000. The machinery is to be delivered within 60 days and it is expected that the system will be complete early in October.

St. LAMBERT, QUE.—The town council is taking steps to extend the electric lighting plant.

GENERAL MANUFACTURING.

MONTREAL, QUE.—The Sultana Mfg. Co. recently took out a permit for a $20,000 fireproof factory.

PORT ARTHUR, ONT.—Mr. Anderson is Contemplating the establishment of a factory here to manufacture wash tubs.

NEW WESTMINSTER, B.C.—The Tacoma Match Co., of Tacoma, will probably establish a factory here.

ALLISTON, ONT.—Defriez & Woodman, manufacturers of high-class jewelry and silverware, will establish a factory here probably about the first of the year. The firm is an amalgamation of three Toronto concerns.

GUELPH, ONT.—The Aspinwall Manufacturing Co., of Jackson, Mich., are taking steps to double the capacity of their plant here. They manufacture farm implements.

SARNIA, ONT.—Geo. S. Tillotson, treas. and manager of the Sterling Emery Wheel Mfg. Co., of Tiffin, Ohio, was in town recently. He is contemplating the establishment of a branch factory here.

BUILDING NOTES.

SASKATOON, SASK.—G. A. Martin will erect a three-storey temperance hotel here at a cost of $70,000. The building will contain 140 bedrooms with bath, etc., in each.

VANCOUVER, B.C.—S. Jones will add six storeys to his two-storey building at the corner of Hastings and Hosmer Streets. The estimated cost is $125,000.

WINNIPEG, MAN.—Sveral large building permits were issued here recently, one to the Swift Canadian Co. for a wholesale market to cost $58,000 and a new refrigerator building to cost $30,000, and the other to the Sterling Bank for an up-to-date building. Swift and Co.'s buildings will be thoroughly equipped with refrigerators and cooling apparatus.

CANORA, SASK.—Jno. Limolt will make extensive additions to his hotel here. The entire building will be electric lighted, steam heated and modernized by a system of fire protection. The proprietor is installing his own electric light and waterworks plant.

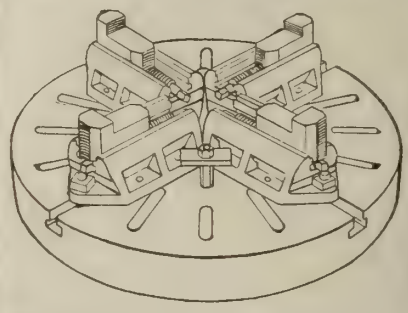
TORONTO, ONT.—Mark Bredin, general manager of the newly formed Canada Bread Co., says that it is the intention of the company to immediately proceed in the erection of a modern bread plant in Winnipeg. He also intimated that the company would devote particular attention to the western field with great probability of it having plants in Regina, Calgary and Vancouver.

PRINCE RUPERT, B.C.—Work has been commenced on the $250,000 storage plant for Wallace & Co., canners, at Claxton on the Skeena River.

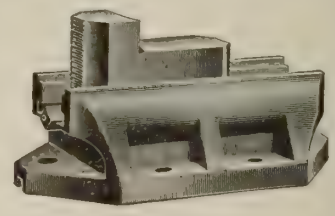
SASKATOON, SASK.—W. B. Sherman, theatrical manager of the Sherman enterprises, is preparing to erect a $100,000 playhouse here.

Jesse M. Warren, architect, recently prepared plans for an $85,000 building for a company of local men. It will be a four-storey fireproof and of reinforced concrete.

In Close Quarters



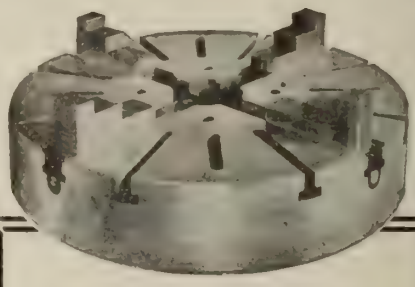
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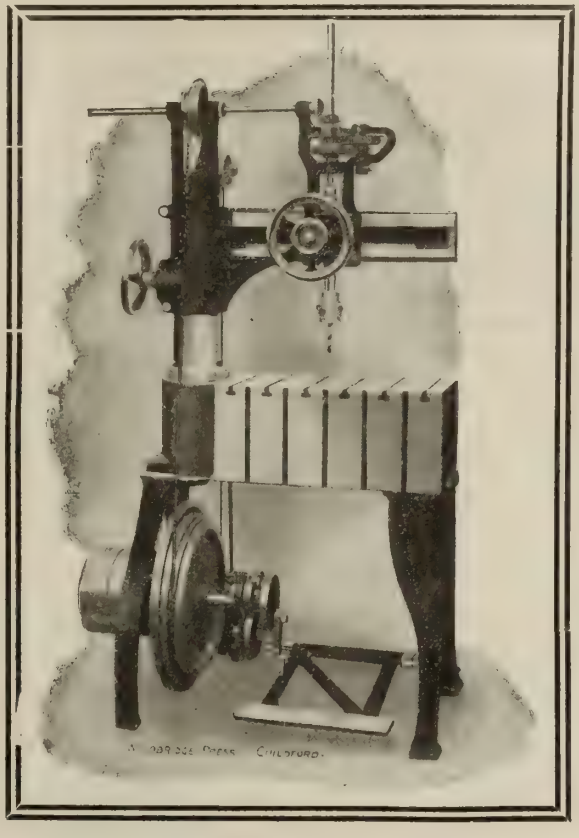
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SAW AND PLANING MILLS.

LADNER, B.C.—A new saw mill, near East Delta, operated by its proprietor, Mr. Moner, has started work. It has a cutting capacity of 40,000 feet per day. A planing plant is also being added.

VANCOUVER, B.C.—An electrically-driven saw mill and a box and door factory, representing an expenditure of $500,000 exclusive of the site, will be erected at the upper end of Lulu Island, by the British-Canadian Lumber Corporation. The driving of piles has just started and it is expected that the mill will be ready by January 1. 300 men will be employed.

FENELON FALLS, ONT.—A disastrous fire occurred here recently when Thomas and Connell's saw mill was wiped out by fire. A large shingle mill was also destroyed.

MERRITT, B.C.—Fire did $175,000 damage to the Taylor mill here recently. The entire plant, holds and 2,000,000 feet of lumber were destroyed.

VICTORIA, B.C.—The Canadian Puget Sound Lumber Co. have let a contract for $25,000 refuse burner to the Muskegon Boiler Works at Muskegon, Mich.

CONTRACTS AWARDED.

HAMILTON, ONT.—Messrs. David Dick & Sons, of Welland, Ont., have secured the construction work in connction with an addition to be made to the plant of The International Harvester Co. The structure will be of reinforced concrete, and cost approximately $250,000.

GUELPH, ONT.—The construction work in connection with a factory for the Independent Fire Co., has been awarded to Messrs. P. H. Secord & Sons, of Brantford. The amount is reported to be $47,000.

MONTREAL, P.Q.—The tender of the Northern Electric Co. to install a police alarm system throughout Westmount was accepted at $9,000 by the municipal council.

The Dominion Bridge Co. will do the steel work on the new fire station which amounts to $4,420, and the tender was accepted of Martin J. Quigley for plumbing on the station, amounting to $1,080.

NAME CHANGED AND PLANT ENLARGED.

The firm name of Bowes, Jamieson & Co., Hamilton, Ont., Can., manufacturers of stoves and ranges, has been changed to Bowes-Jamieson, Ltd. J. R. and J. W. Jamieson, sons of the former proprietor, will have charge of the active management of the business. The company is capitalized at $100,000. Shortly after the first of the year the company will enlarge its plant, the general arrangement of the foundry will be changed and the tonnage will be increased from 4 to 20 tons per day. Molding machines will be installed and some work will be mounted on match-plates. The company is in the market for a set of patterns of a medium-priced line of warm air furnaces.

ELECTRICAL STREET CONCRETE MIXERS

Something new in the line of street concrete mixers has been recently adopted by the city of Montreal. The unique feature of the 4 new machines which were supplied by F. H. Hopkins & Co. is that they are electrically driven. The power is derived from 550 volt, 3-phase, 60 cycle induction motors. The mixers are made to load at the end and discharge at the rear, which makes them continuous in operation. They can also travel by their own power.

REFRIGERATION PLANT ORDER

The Hume Hotel, Nelson, B.C., has contracted with the Armstrong Machinery Co., Spokane, Wash., for the installation of a 3-ton refrigeration plant for general hotel use. It will be operated under the direct expansion service and installed at once. One of the new type Alaskan compressors will be used.

BIG SMELTER FOR KENORA.

There is every indication that Kenora, Ont., will have the biggest plant for the treatment of iron ores by electricity in the Dominion. Plans are about completed for the establishment at Kenora of a gigantic smelter for treating electrically the iron ores of a newly found field near Dinorwic, on the C.P.R. The vicinity of Keewatin Power company's dam within the town limits will be the site of the new smelter, and the 40,000 horse power available at the dam will be utilized. Several thousand men will necessarily be employed, and Kenora will receive a great impetus in every way. The new company, among whom is Cawthra Mulock, of Toronto, have retained the Reese Engineering Co., of Winnipeg, as technical advisors.

RUBBER BELT ORDER.

The Goodyear Tire & Rubber Co., of Canada, Ltd., have received an order for 12,000 feet of Elevator Belting, being the rubber belt equipment of 27 elevators for the Province of Saskatchewan.

CATALOGUES.

The Dominion Belting Co., Hamilton, Ont., are distributing among their customers and friends, a set of pretty girl blotters, emblematic of various well-known flowers.

Butterfield & Co., Rock Island, Que., have issued a new catalogue descriptive of their large line of Screw Plates, Taps, Dies and Reamers. The catalogue includes several useful tables, such as sizes of tap drills, etc. Like most of the leading tap makers, Butterfield & Co. are urging the disuse of the V thread.

The Garvin Machine Co., New York, have forwarded us a copy of their new catalogue, Edition DA, which illustrates and describes some of their numerous machine tool productions, including Profiling, Duplex Milling and Vertical Spindle Milling Machines; Universal Cutter and Surface Grinders, Vertical, Horizontal and Automatic Tapping Machines, Gang Drills and many others. The catalogue is of convenient size—6 by 9 inches and attractively got up.

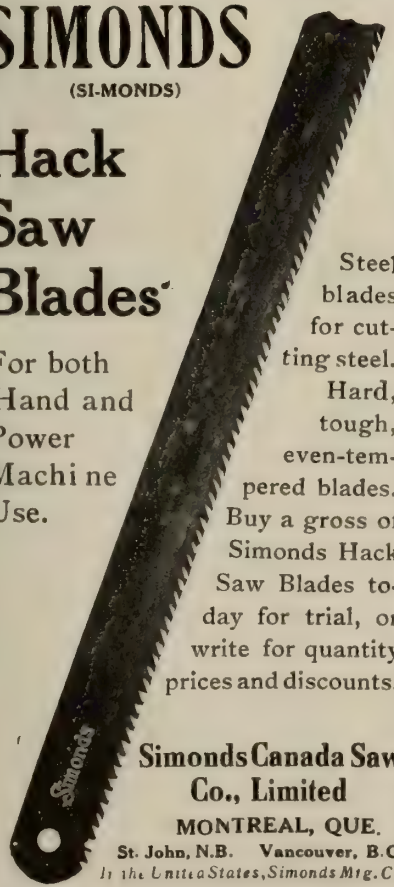
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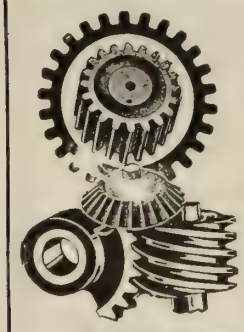
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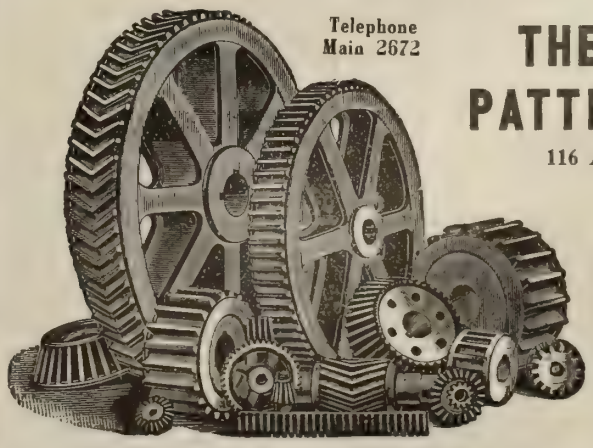
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GALT FOUNDRY CO. GALT, ONT.

T. W. Broadbent, Ltd., Victoria Electrical Works, Huddersfield, England, have issued a new leaflet descriptive of their N type alternating motors for one, two and three phase circuits. A special feature of these motors is the robustness of their construction, both mechanically and electrically; all insulating materials being especially selected with a view to withstanding the high temperatures due to heavy and frequent overloads. The motors are well suited to conditions requiring a motor that is practically indestructible; while at the same time they have a high efficiency and power factor, with small percentage of slip.

The Cleveland Pneumatic Tool Co.'s new Catalogue L has lately reached us. It is very compact, yet complete, and illustrates the numerous high-class pneumatic tools manufactured by the firm; including Riveting, Chipping, Beading and Calking Hammers; Reversible and Non-Reversible Drills; Grinders, Floor and Bench Rammers, etc., etc. All the air drills have annular ball bearings on the crank shaft, a feature which originated with this company, and one which gives considerable gain in power over machines with plain bearings. All the tools and machines are illustrated and described, and the catalogue also contains accurately compiled tables of capacities, arranged for ready reference.

The Browning Engineering Co., Cleveland, Ohio, have sent us a copy of their new catalogue of Locomotive Cranes, which has just been issued. The book is well got up, and illustrated by numerous half-tones, showing their well-known cranes at work under varied conditions. The company makes locomotive cranes of all types, operated by steam, electricity or air. Their general construction is fully described in the catalogue, and impresses one with their apparent fitness and capacity for efficient, reliable and economical service.

"Hydraulic Pumps, Catalogue No. 81" is the title of a new 120-page 6x9 catalogue descriptive of many standard, and several new types of hydraulic pumps. This catalogue, issued and sent free by the Watson-Stillman Co., 50 Church Street, New York, contains valuable information for hydraulic engineers and users of hydraulic machinery.

Hawksley, Wild & Co., Sheffield, England, have sent us a 4-page leaflet containing an illustrated description of the "Brightside" water-tube boiler manufactured by them. The cuts represent 4 and 6-drum types for hand-firing, as also an adaptation of superheater and chain grate stoker. The tubes are straight and almost vertical, and are arranged without headers and caps. The arrangement generally is compact and provides for high efficiency and ease of overhaul and inspection.

The Dudbridge Iron Works, Stroud, Gloucester, England, have issued an 18-page catalogue, descriptive of the Dudbridge new type gas engines and gas producer plants. The constructional details are fully illustrated and described, and show features worthy the attention of all interested in this form of power generation.

Bulletin No. 48, "Resistance to Flow Through Locomotive Water Columns," by Arthur N. Talbot and Melvin L. Enger, records the results of tests of fourteen of the principal forms of locomotive water columns or cranes in use on the railways of the United States. Besides giving the loss of head at various rates of discharge, the tests provide data on the hydraulic characteristics of the valves. Water hammer, relief valves, friction losses through pipe lines, and methods to be used in the design of water service installations are also considered. The bulletin should be of interest to motive power and maintenance of way men. Copies of this bulletin may be obtained gratis upon application to W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Illinois.

BOOK REVIEW.

STEAM TURBINES—By Joseph W. Roe, A.S.M.E., A.I.M.E., Assistant Professor of Mechanical Engineering, Sheffield Scientific School, Yale University; 143 pages, 6x9 inches, illustrated; published by The McGraw-Hill Book Co., 239 West 39th St., New York.

This is a short treatise on the theory, design and field of operation of steam turbines and has been written to provide a text-book suited to a short course on the subject, in engineering schools, and also to provide a book for the engineer on the principles and general design of turbines, without going into refined treatment of the more difficult problems entering into that design.

The author treats of all types of turbine and at the end of each section gives a list of references to other works on the subject. The mechanical problems of construction are fully dealt with, and there is an extremely interesting chapter dealing with the relative economy of steam engines and turbines.

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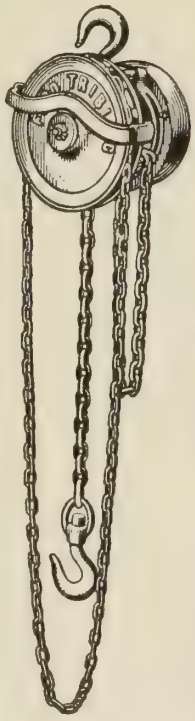
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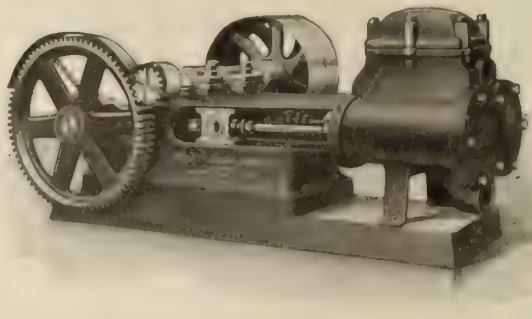
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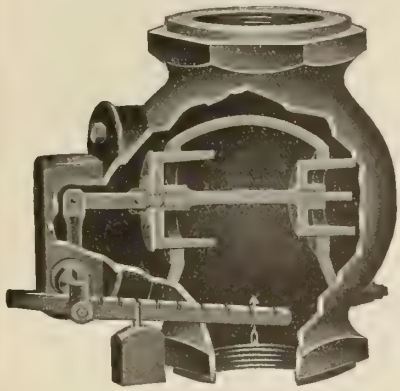
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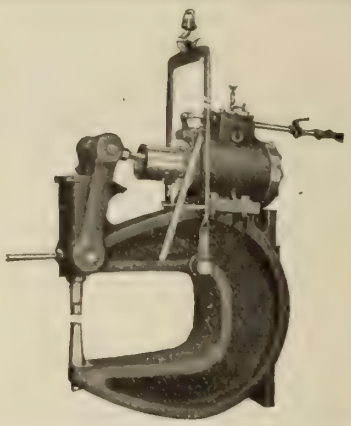
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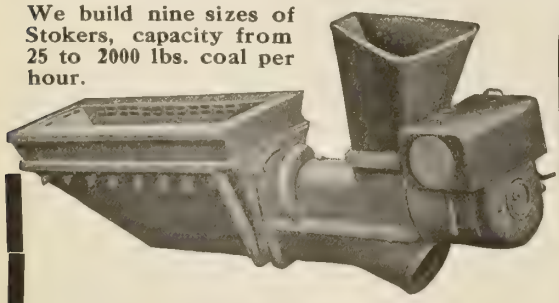
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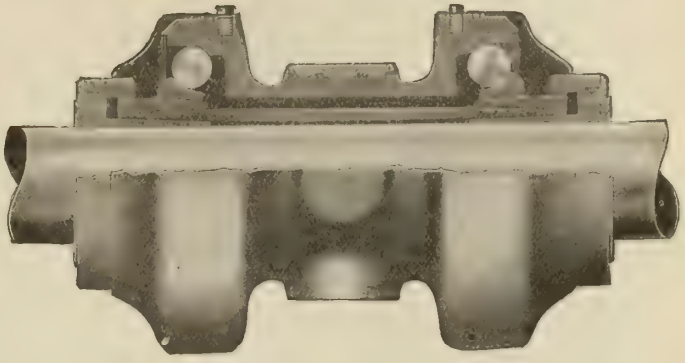
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Wear and tear on your entire transmission equipment.



They will fit any standard adjustable hanger. It will pay you to let us figure on your new equipment or on changing your old one to a modern basis. Consult us on Loose Pulley and Friction Clutch Pulley Troubles.

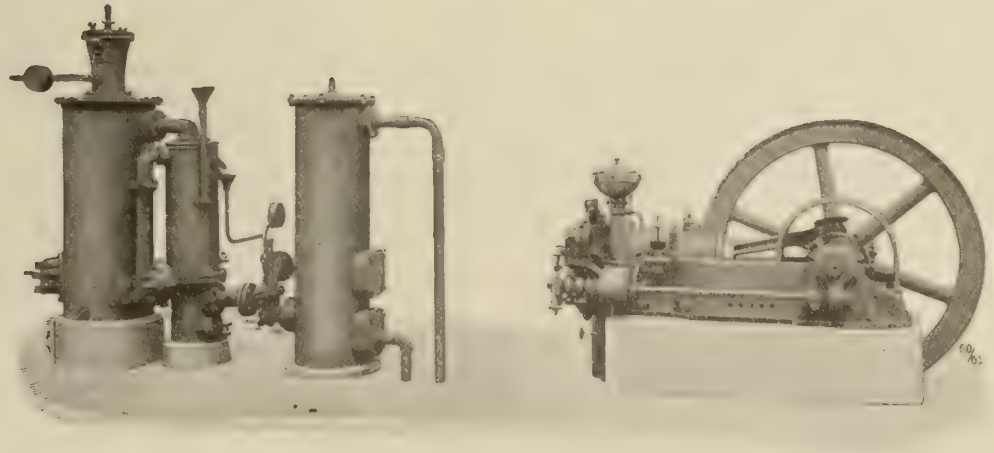
See our Demonstrating Exhibit in Machinery Hall, Toronto Exhibition.

The Chapman Double Ball Bearing Company of Canada, Ltd.

347 SORAUREN AVENUE, TORONTO, CANADA

PHONE PARK 2790

Gas Producers for All Kinds of Fuel



Gas Engines. Diesel Engines. Benzine Engines.

K. LINDEMANN

204 St. James Street - - Montreal, Quebec



HOFFMANN STEEL BALLS

(The Standard of Accuracy)

are each and every one guaranteed correct to Standard Size within

$\frac{1}{10\,000}$ **of an Inch**

They are not only all alike in each box, but **they never vary from box to box.** They are all perfect spheres—it is impossible to measure any imperfection in their shape.

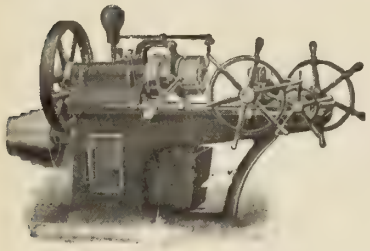
Made of the very finest quality high carbon chrome steel, tempered with scientific accuracy, with toughened interior and surface glass-hard, Hoffman Steel Balls are now recognized the world over as the standard.

FOR CATALOGUE AND PRICES WRITE

JOHN MILLEN & SON, Ltd.

Montreal Toronto Winnipeg Vancouver

Address all correspondence to 321 St. James St., MONTREAL



MODERN

Bolt, Nut and Forging Machinery and National Wire Nail Machines

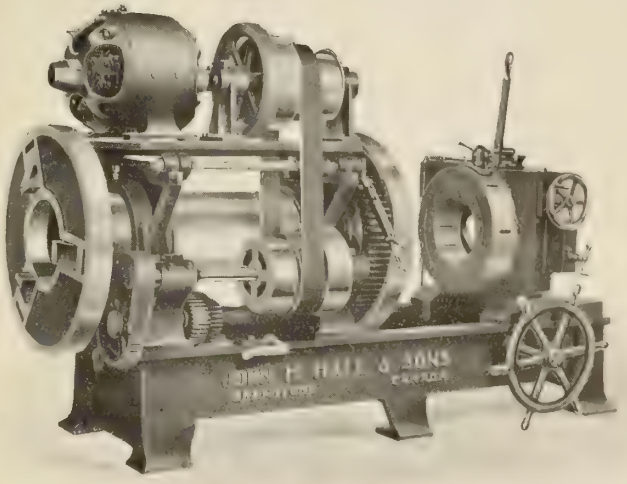
THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

BOLT THREADERS, "WEDGE GRIP," BOLT and RIVET HEADERS, FORGING MACHINES, NUT MACHINES ROLL THREAD MACHINES, Etc., Etc.

Complete Catalogue "E" upon request.

The National Machinery Co., Tiffin, O., U.S.A.

Canadian Agents: H W PETRIE, Toronto Ont WILLIAMS & WILSON, Montreal, Que.



PIPE THREADING MACHINES

Our No. 18, Duplex Improved, equipped with Peerless Die Head mechanism.

Capacity 8 in. to 18 in., either belt or motor drive.

Write us for prices on various sizes from ⅛ in. to 18 in. Also single and double head rapid nipple machines.

John H. Hall & Sons,

BRANTFORD, CANADA



Brass Rod, Brass Tubing, Sheet Brass

Large quantity carried in stock.

Write for August Stock List.

Tallman Brass & Metal Co.

HAMILTON, ONT.

The advertiser would like to know where you saw his advertisement—tell him.

ATLAS
Chain Blocks



REPRESENT

Speed, Safety and Durability

No matter how hard the usage they will stand it. They are made of wrought Iron and Steel throughout.

Every Block sold under a Guarantee

All sizes always in stock.

Schuchardt & Schutte
307 Coristine Bldg. - Montreal, Que.



Wouldn't it pay you to kill those Gear Noises?

On a merry-go-round, the music is employed to kill the gear racket. We don't cite this as a suggestion that a brass band should be put in any shop or office, but pleasant surroundings are just as desirable during working hours as at other times. Employes do more and better work where there is no inharmonious ring and clatter, there is better feeling and less chance of costly misunderstandings, and any man appreciates attention to his comfort.

The change to New Process Pinions really involves no expense. The wear, vibration and power loss—these are what noise indicate—disappear.

WRITE FOR BOOKLET.

36

The NEW PROCESS RAW HIDE Co.
OFFICE & WORKS N.P.R.H. SYRACUSE, N.Y.

"Oneida Economy"



Oneida Steel Pulleys are a quarter to a third the weight of cast iron and therefore save from two-thirds to three-quarters of the power required to revolve a cast iron pulley.

The oval crown face fits the belt perfectly, offering 20% better belt adhesion than any other pulley on the market.

Do You need Economy?
Get the Oneida.
It is the best.

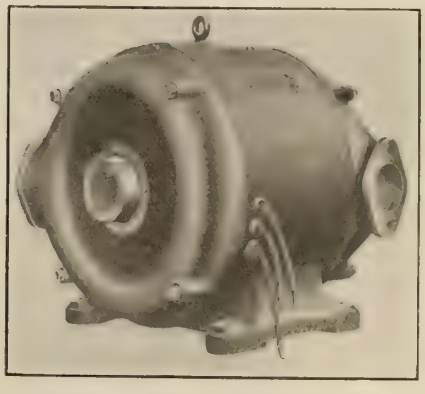
SEND FOR OUR CATALOGUE

Oneida Steel Pulley Co.
Oneida, N.Y.

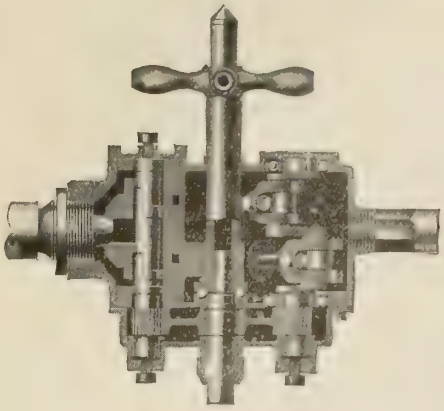
The Lancashire Dynamo & Motor Co., Limited
152-4 Bay Street, Toronto

Electrical Machinery

For all purposes. Delivery of Motors and Spare Parts from Canadian stock.



PIPE VENTILATED A.C. MOTOR
FOR VERY DIRTY PLACES



Adapted for—Drilling, Reaming, Tapping, Flue Rolling and Wood Boring, and for setting Plain and Flexible Stay Bolts and Nipples.

WE MANUFACTURE

RIVETING, CHIPPING, CAULKING AND BEADING HAMMERS, AIR DRILLS (ALL SIZES), PORTABLE EMERY GRINDERS, SAND RAMMERS, CORNER DRILLS, ETC.

AIR DRILLS

Cleveland AIR TOOLS

REVERSIBLE — NON-REVERSIBLE

Made in correct sizes for all classes of work.

BALL BEARING TYPE

Annular Ball Bearings on Crank Shaft as shown in the accompanying illustration are an original CLEVELAND FEATURE and are the greatest improvement in AIR DRILL construction since their inception.

Service tests of Cleveland Ball Bearing Air Drills show a gain of more than 40% in power over the plain bearing machine.

Ball Bearings eliminate friction and all lateral motion of Crank Shaft, thus protecting main gear and pinions from undue strain.

CLEVELAND FEATURES

- ¶ ONE PIECE CYLINDER BODY.
- ¶ SINGLE VALVE CONTROL.
- ¶ HAND HOLES IN CRANK CASE.
- ¶ BALL BEARING CRANK SHAFT.
- ¶ THROTTLE OR LEVER REVERSE.
- ¶ INSIDE OR OUTSIDE EXTRACTION OF TOOLS.
- ¶ INTERCHANGEABLE CHUCKS, SQUARES OR TAPERS.

The Cleveland Pneumatic Tool Co.

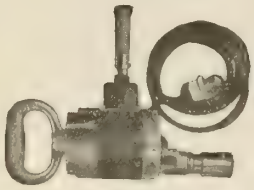
NEW YORK — General Offices and Works, Cleveland, Ohio, U.S.A. — CHICAGO

A. R. Williams Machinery Co., TORONTO, WINNIPEG, VANCOUVER and ST. JOHNS

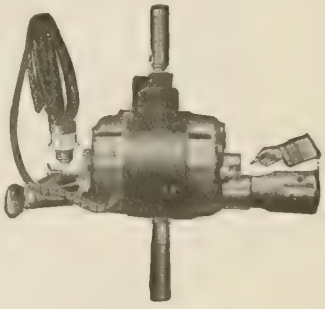
Williams and Wilson, MONTREAL

U. S. Electric Drills and Grinders

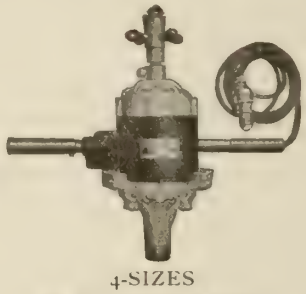
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



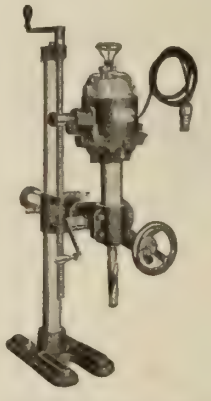
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by THE CANADIAN FAIRBANKS CO., LTD.

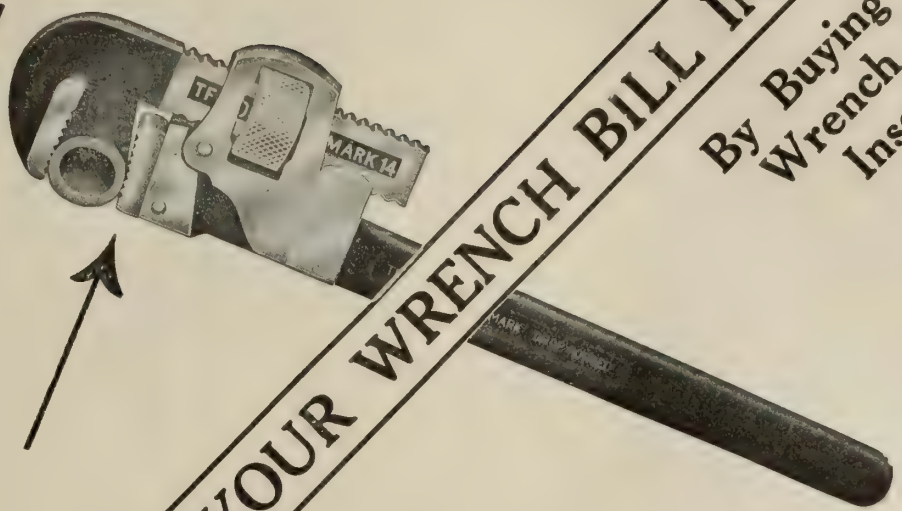
Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - OHIO, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

USE
The Trimo
Pipe Wrench



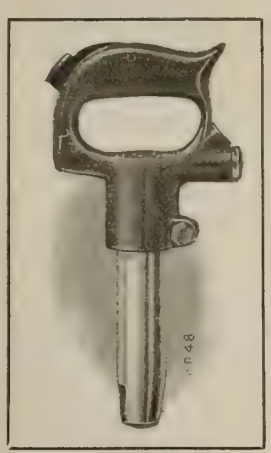
AND CUT YOUR WRENCH BILL IN TWO

By Buying the Pipe Wrench with the Inserted Jaw In the Handle

Send for Catalog No. 200

Made by The
Trimont Mfg. Company
55-71 Amory St - Roxbury, Mass

PNEUMATIC TOOLS



The absolute safety and simplicity of transmitting compressed air, its wide range of profitable uses and the economies effected by its uses, give it an indisputable position of supremacy as a means of transmitting power for operating small portable tools.

Pneumatic tools are not delicate, complicated pieces of machinery, but positively simple, rugged little money savers, made to stand rough usage, yet maintain their efficiency.

In "Imperial" designs wearing parts are reduced to the reasonable limit of simplicity, and manufactured to give the greatest satisfaction.

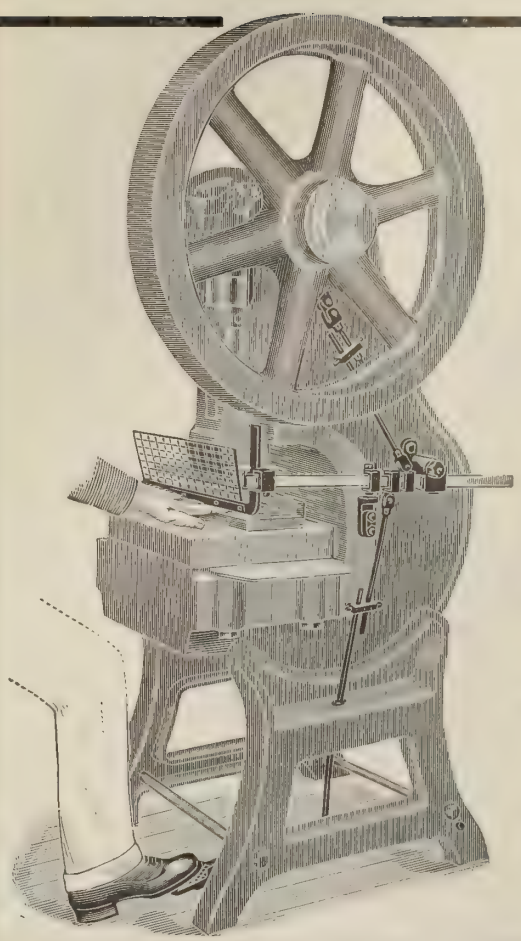
No part of a plant equipment, representing the same investment, will do more to reduce labor costs, increase output and enlarge dividends than a good pneumatic tool equipment. We firmly believe that "Imperial" tools represent the very best sustained value, first costs, maintenance and operating costs being considered. They are thoroughly well designed, embody all practical up-to-date improvements and give very exceptional efficiencies. These features have won for "Imperial" tools their present favored position.



CANADIAN RAND CO., LIMITED

Commercial Union Building, MONTREAL, Que.

TORONTO COBALT WINNIPEG LETHBRIDGE ROSSLAND VANCOUVER SPOKANE HALIFAX SYDNEY



SAFETY

For Employees

Against loss of hands.

For Employers

Against loss by damage suits.

The **JONES GUARDS** give this, and without interfering with output of work.

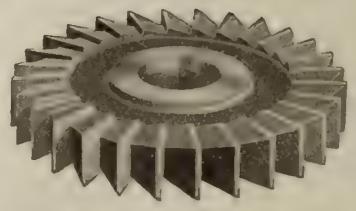
Guards for Presses, Saws, Jointers, Shapers, etc.

Particulars and prices on application

The Jones Safety Device Company, Limited

22 King William Street
HAMILTON ONT.

Branches in United States:
Buffalo, N.Y. New York, N.Y
Chicago, Ill.



National Cutters

Will increase the efficiency of your men and your machine.

Will give the longest and most satisfactory service.

They are made from the highest stock by the most approved methods and are fully guaranteed. A trial will convince.

WRITE FOR CATALOG B.

THE NATIONAL TOOL CO.

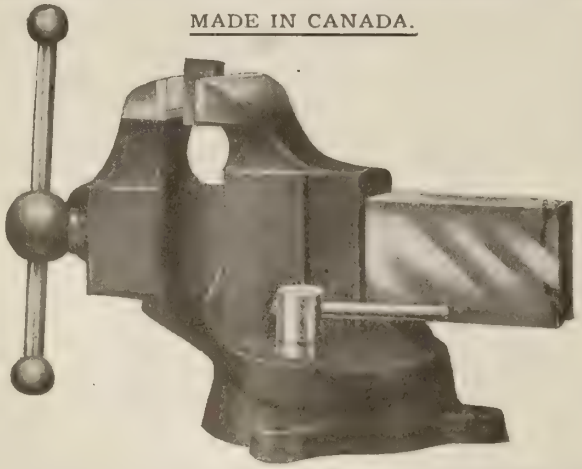
Cleveland
Sixth City



The YOST

Solid Jaw and Swivel Bottom Machinist's Vise

MADE IN CANADA.



A vise with a grip like grim death; a durability that defies time and the hardest usage.

A vise that will give you a lifetime of perfect service and satisfaction. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

Incomparably Good

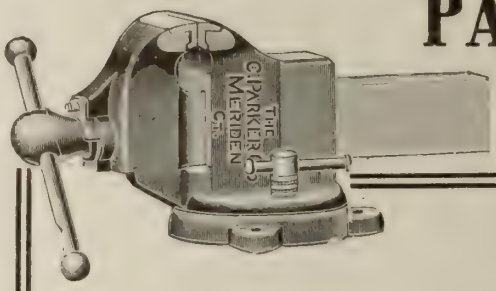
The National catalog would certainly interest you. Write us, asking for a copy.

National Machinery & Supply Co., Ltd.

HAMILTON - - ONTARIO

This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.

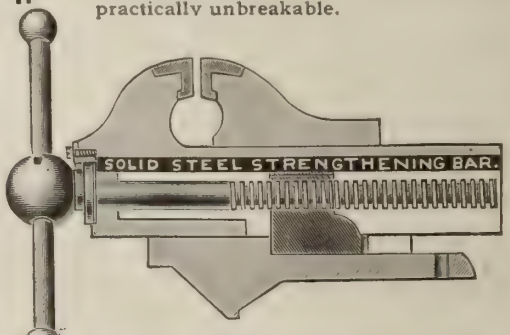
PARKER VISES



Parker Vises are guaranteed the strongest, most satisfactory, and most durable yet produced.

They are made from a mixture of Cast Iron and Bessemer Steel carefully selected, and manufactured by skilled workmen.

Our solid Jaw Swivel Vises have a steel strengthening bar inserted, and welded into the Casting, rendering the Slide practically unbreakable.



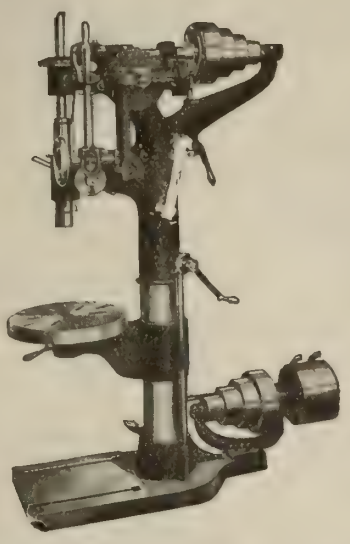
Write for Catalog and Prices

The Charles Parker Co.

Meriden, Conn., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

The BARNES DRILLS



Complete line. 8 inch to 50 inch swing.

Gang Drills.—Horizontal Drills.

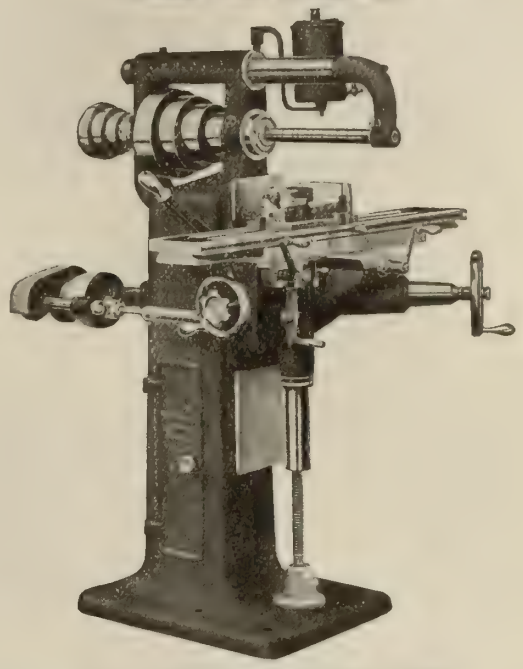
SEND FOR CATALOG.

W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO.
Toronto, Montreal, Winnipeg, Vancouver, St. John, N.B.

Trade FOX Mark

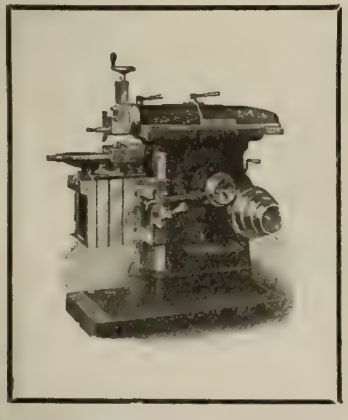


No. 3 1-2 Hand and Power Feed Miller

The Miller illustrated is designed so that one operator can run 4 machines and keep all machines in continual operation.

Write to-day for further particulars of this cost reducer.

FOX MACHINE COMPANY
23 N. Front St., Grand Rapids, Mich.
30 Church Street, New York City



Steptoe Shapers are

GOOD: Because of the care taken in construction.

STRONG: Because the Column, Ram and Base are heavily ribbed and braced and the metal placed where it is needed.

DURABLE: Because all wearing surfaces are hand scraped to standard surface plates and provided with gibs to take up any wear.

The John Steptoe Shaper Co.

1953 Jessamine Street - - - - CINCINNATI, OHIO

Agents: GENERAL SUPPLY CO. OF CANADA, Limited, Ottawa, Toronto and Winnipeg



High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

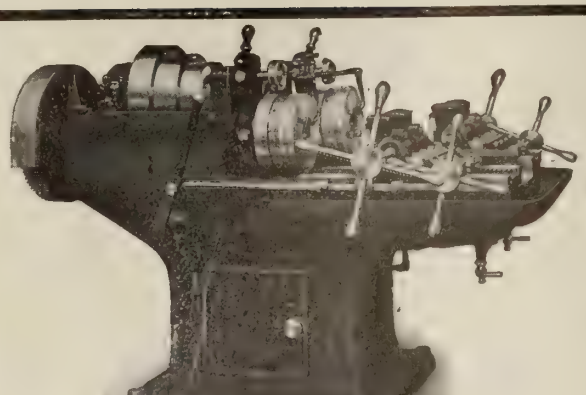
Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.

2305 Farmers Bank Building, PITTSBURG, PA.

EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO
Manufactured under Davy Bros., Ltd., Patents.



Protected by Patents

Heap's High Speed Screwing Machines

fully meet the demand for accurate and durable machines, unsurpassed in quality and containing the latest and best features for convenient operation, and large and accurate output. The perfecting of these machines did not happen at once; it took time and careful experimental preparation. Each of the new features embodied in these Screwing Machines has been under severe service and rigid test for a considerable period.

SEND FOR FULL PARTICULARS

Joshua Heap & Co., Ltd.,

ASHTON-UNDER-LYNE, ENGLAND

Canadian Agents: PEACOCK BROS., Montreal

MACHINE TOOL
AND
DIE MAKERS

Russell Machine Co. St. Catharines, Ont.

First-class Workmanship

Prices Right

Estimates Furnished to the Trade

TELEGRAPHIC ADDRESS "HALLTYNE" WORKS PHONE MAIN 256

THE HALL ENGINEERING WORKS

14 TO 16 JURORS STREET, MONTREAL

ENGINEERS, BOILERMAKERS, BRASS & IRON FOUNDERS, COPPER SMITHS & BLACKSMITHS, SHIP REPAIRS A SPECIALTY

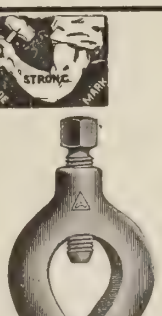
Agents for J. & E. Hall's Refrigerating Machinery.
Atlas Preservative Co. & United Asbestos Co.
W. H. Allen, Son & Co., Ltd.
ENGLAND

THOMAS HALL Phone West 1737

Late Supt. Engineer Messrs. Elder Dempster & Co. & Can. Pac. Rly. Co., London

ARMSTRONG

DROP FORGED STEEL LATHE DOGS



All Kinds
All Sizes
3-8 in. to 8 in.



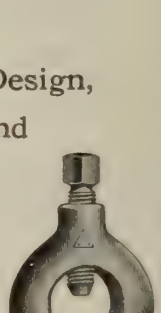
HEAVY DUTY DOG

Write for Special Circular and Discounts.

Have Armstrong Quality

Best Obtainable in Design, Workmanship and Material

If you Want the BEST Specify ARMSTRONG Drop Forged Dogs



POINTS OF EXCELLENCE

Uniformity of design.

Tool steel set screws with our improved beveled point which prevents upsetting.

No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.

Armstrong Bros. Tool Co., "The Tool Holder People" 106 N. FRANCISCO AVE., CHICAGO, U. S. A.

NICHOLSON
MADE FILES

are known throughout the country for their unvarying keen cutting qualities. They are guaranteed to outlast any other brand on the market.

During the many years of constant service the Nicholson-Made File has won the confidence of every skilled mechanic who has given it a trial.

Our Files are not high-priced, but cannot be excelled in quality.

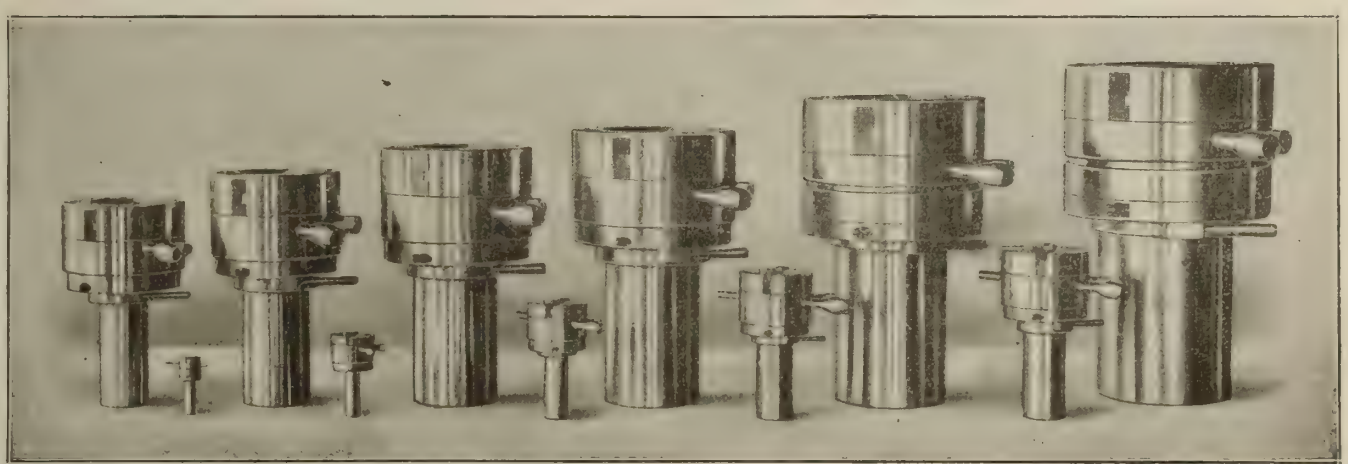


Nicholson-Made Brands manufactured in Canada are:—AMERICAN, ARCADE, GREAT WESTERN, GLOBE, EAGLE, McLELLAN, KEARNEY & FOOT, J. B. SMITH.

WRITE FOR PRICES OR ASK YOUR DEALER

NICHOLSON FILE CO.

DOMINION WORKS - PORT HOPE, ONT.



Geometric Self-Opening and Adjustable Die Heads are at the Top.

Our Standard, or Style "D" Die Heads, are made for cutting Screw Threads from ⅛-in. to 4½-in. diameters inclusive, each size Die Head being adjustable for a good range of diameters.

Chasers can be instantly adjusted or interchanged.

There is no running back over the work after the thread is cut.

One of the Die Heads, fitted to your Screw Machine or Turret Lathe, will give you greatest output at least cost.

Send for our Style "D" Catalogue.

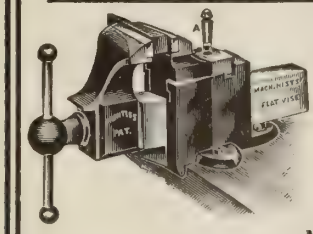
THE GEOMETRIC TOOL COMPANY - New Haven, Conn.

Canadian Agents:—Williams & Wilson, Montreal, Que. A. R. Williams Machinery Co., Toronto, Ont.



HINTS TO BUYERS

Do Not Be Misled by Inferior Imitations.



There is but one

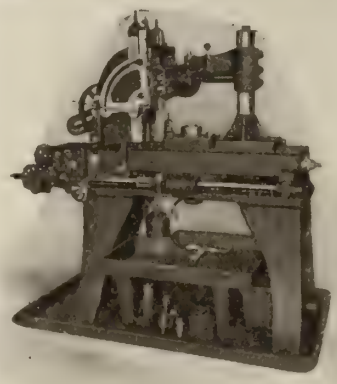
PRENTISS VISE

Made by

Prentiss Vise Company

Hardware Building, 106-110 Lafayette St., Cor. Walker St., NEW YORK

Sole Agents for Canada; A. Macfarlane & Co., Coristine Bldg., Montreal.
Sole Agents for Great Britain; Chas. Neat & Co., 112 Queen Victoria St., London, E.C.



The Whiton AUTOMATIC Gear Cutting Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.



Rockwell

MEDIUM SIZED FORGE

Furnaces

For small hammer work, bull-dozer work, spring fittings, etc.

Strong, Durable, Simple. Made in Standard Sizes.

Write for Catalog No. 26

W. S. ROCKWELL COMPANY

50 CHURCH ST., NEW YORK (Hudson Terminal Bldg.)
(The Original Furnace Rockwell)

NORTON JACKS

Standard on the Leading Railroads

Made in Canada.
Stock carried for **immediate shipment.**



Manufactured only by

A. O. NORTON,

COATICOOK, Prov. QUEBEC.

STOCK CARRIED BY

MUSSENS LIMITED, - Montreal and Winnipeg

H & E PATENT BALL BEARING LIFTING JACKS
for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.

Made in plain and foot lift styles, fully guaranteed.



Manufactured by

H & E Lifting Jack Company
WATERVILLE, QUE.

Stock carried by F. H. HOPKINS & CO.
Montreal

CUT GEARS
THEORETICALLY CORRECT
IN
RAWHIDE OR METAL

ROBERT GARDNER & SON LTD
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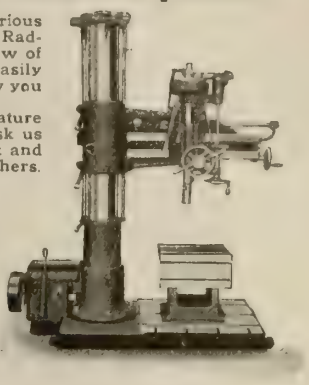
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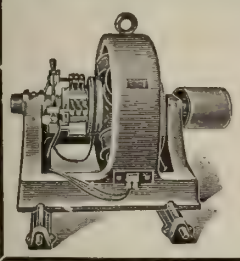


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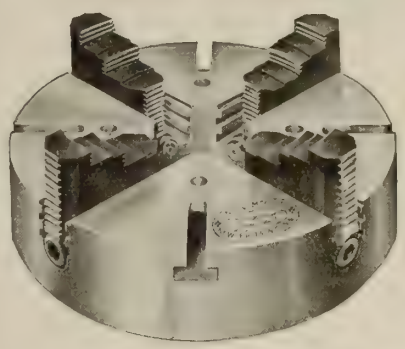
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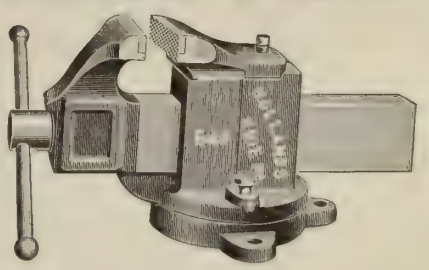
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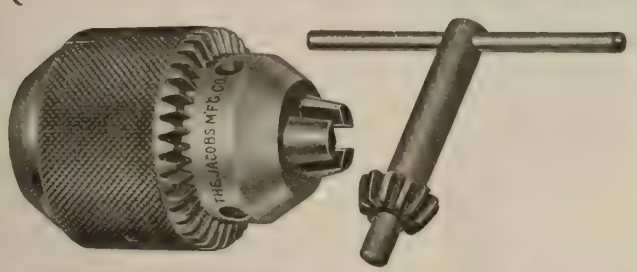
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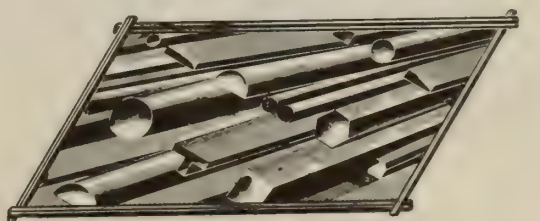


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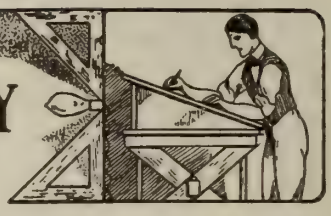
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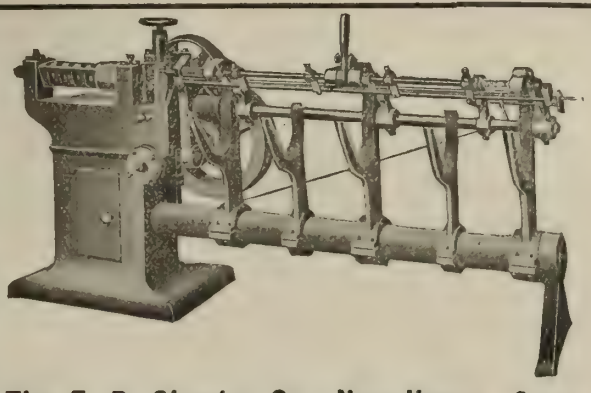
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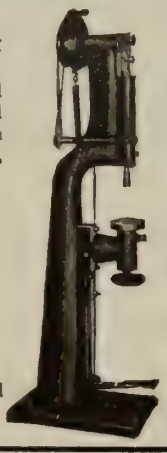
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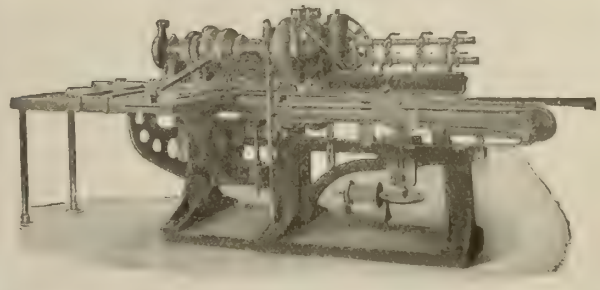
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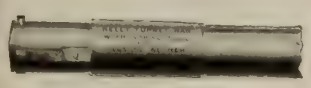
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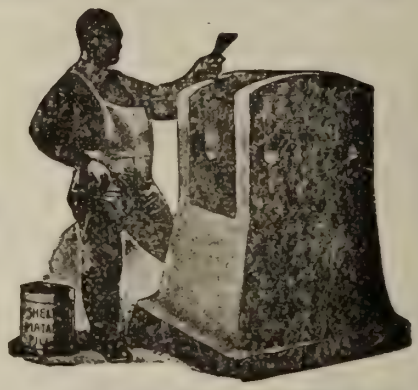
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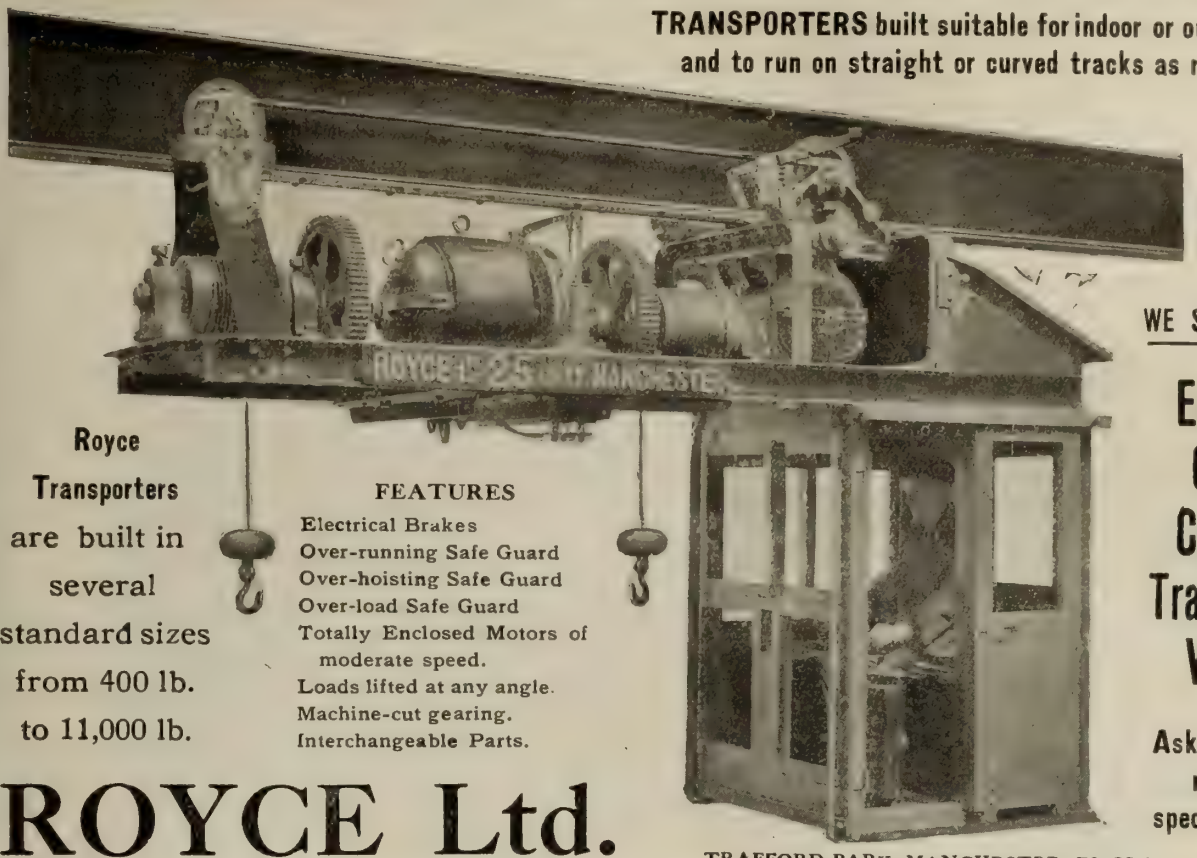
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SEND FOR BOOKLET
JOHN MILLEN & SON LIMITED
321 ST. JAMES ST. MONTREAL.
ALSO
TORONTO - WINNIPEG - VANCOUVER

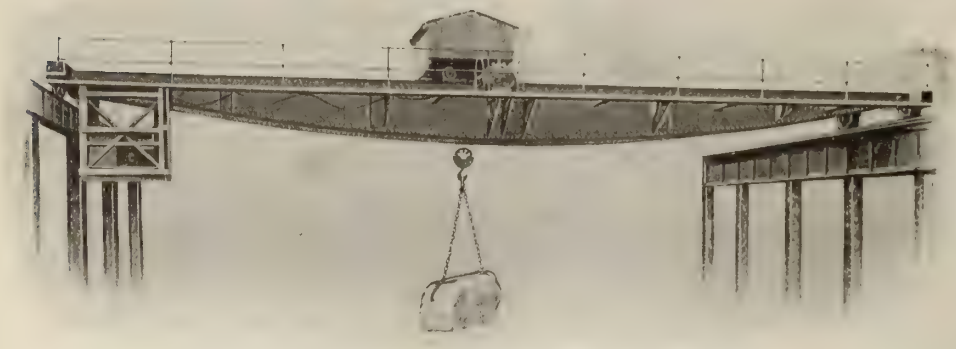


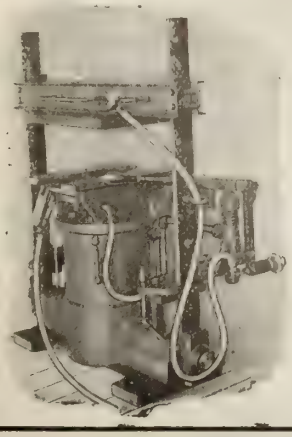
Photo of 5-ton Motor Travelling Crane, 60-foot span

Geo. Anderson & Co., Ltd.
86 Notre Dame St. West
MONTREAL
and CARNOUSTIE, SCOTLAND.

Makers all sizes of

Travelling Cranes
Electric Derricks
Steam Derricks
Locomotive Cranes

Send for catalogue and Prices.



A LIGHT POWER SQUEEZER FOR BENCH WORK

and a complete line of

FOUNDRY MOULDING MACHINES FOR ALL KINDS OF FOUNDRY WORK

Standard and Other Types to Suit Conditions

THE TABOR MANUFACTURING CO.

18th and HAMILTON STS. PHILADELPHIA, PA., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

LOCOMOTIVE CRANES

AN efficient Locomotive Crane is an economy of gigantic proportion, where weighty or bulky materials must be handled.

ECONOMY
MEANS SUCCESS

in contracting as well as milling operations
We manufacture appliances for both, such as

STEAM SHOVELS, LOG LOADERS,
AUTOMATIC BUCKETS and
ELECTRIC MAGNETS.

Whatever your problem may be, let us suggest a solution which will save you money.

THE BROWNING ENGINEERING COMPANY
CLEVELAND, OHIO.

This Gravity Molding Machine



really is the only one on the market that completes a perfect mold automatically without stripping-plates or hand-work. You cannot afford to be without it.

WE ALSO CARRY

Jar and Squeeze Molding Machine.
Hauck Oil Burners.
Cyclone Hoists.
Acme Parting
Red Facing

WRITE FOR OUR CATALOG GIVING FULL PARTICULARS

ONTARIO WIND ENGINE & PUMP CO., LTD.
WINNIPEG TORONTO CALGARY

CRANES



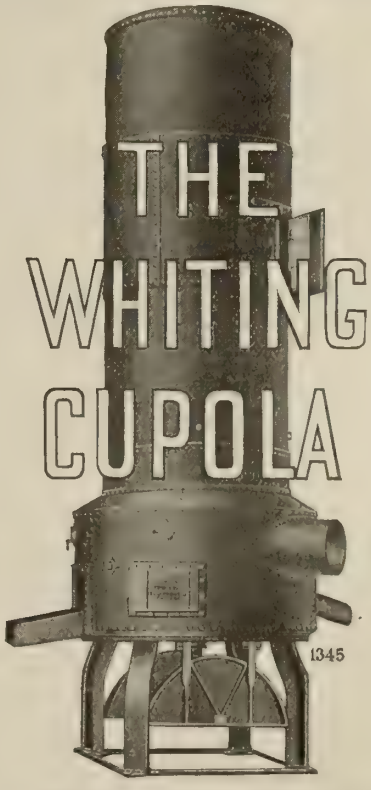
Complete Foundry Plants

Grey Iron, Brass, Car Wheel,
Pipe, Steel and Malleable.

Designed—Equipped—Installed

Our experts assist starting Steel (O.H. & Converter) Malleable and Iron Foundries at a reasonable charge.

PARTICULARS AND PRICES ON REQUEST



Tumblers, Trucks, Ladles, Core Ovens, Core Oven Cars, Elevators, Air Hoists, Converters, Furnaces (Brass, Malleable & O.H.), Annealing Ovens—Tramrail systems, Turntables, Sand Sifters.

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.



THE EMERY USED IN

"DOMINION" Wheels

is mined in the Island of Naxos, in the Grecian Archipelago, and is celebrated for its cutting and wearing qualities.

—OUR AGENTS—

J. R. BAXTER & CO. MONTREAL, CAN.
H. W. PETRIE, LTD. TORONTO, CAN.
McDOUGALS LTD. OTTAWA, CAN.

THE DOMINION ABRASIVE WHEEL & SUPPLY CO., Ltd.
BIRMINGHAM, ENGLAND

Manufacturers

The Dominion Abrasive Wheel Co., Limited
NEW TORONTO, ONT., CANADA

PITTSBURGH EMERY WHEEL CO.

MANUFACTURERS OF

EMERY WHEELS—All kinds and shapes.
SWING FRAME GRINDING MACHINES—Motor and Belt Driven.

CANADA FORD CO.
Montreal

603-604 Park Building,
Pittsburgh, Pa.

The Making of Hollow Castings

The recent introduction of King Kore Kompound has now rendered this, once somewhat difficult, part of Foundry practice comparatively easy.

It has, also, reduced the core expense by more than one-half.

This compound is a black, dry powder, and is used as flour is used, but with one-half the quantity is produced greater and better results.

Its use avoids the danger of swelling or "blowing." The core easily comes out of the casting, and when old cores are ground up, in the rattler, or otherwise, the sand so made is used over again.

The core compound it contains, again becomes a binder under heat of the core oven, as it melts, and so it is used over and over again.

This is Foundry Economy; Flour, Rosin, etc., are now luxuries.

A barrel of King Kore Kompound will be sent "subject to approval" to any inquiring mind.

That is the **Stevens' System** of trying before buying.

I have copies of proportions of compound to sand used and methods followed in core rooms of Foundries in thirteen different States. This information, with other printed matter relative to the subject, will be mailed on request.

I maintain a direct branch at 137 Jarvis St., Mr. J. M. Mayers, Manager, Toronto, Ont., where is stocked a supply of **Foundry Facings, Foundry Supplies, Buffing Compositions,** of my own manufacture.

The stamp of quality pervades them all.

FREDERIC B. STEVENS

Main Office - - - - - - DETROIT, MICH.
Canadian Branch - - - 137 Jarvis Street, TORONTO.

The advertiser would like to know where you saw his advertisement—tell him.



Good cores mean good foundry practice.

Glutrin makes good cores—some people say the best cores.

Robeson Process Company

Grand Mere, P.Q.

Selling Agents:

FRANCIS HYDE & COMPANY

31 Wellington Street

MONTREAL, CANADA



Five years ago, the De Lamar Copper Refining Co. purchased 614 Smooth-On Corrugated Iron Gaskets, for their plant, sizes from 4 to 18 inch pipe.

They wrote us April 14, 1911, as follows:—

Gentlemen:--
Replying to your inquiry as to whether the Corrugated Iron Gaskets which we installed in 1906 in this plant have continued to give satisfaction, we are pleased to state that our steam lines have remained tight and that the gaskets have given no trouble whatever.
Yours truly
LAWRENCE ADDICKS
Superintendent

Just think, not one leak in five years. Why not use SMOOTH-ON GASKETS, and avoid leaky joints and costly repairs?

Our illustrated Catalogue is free. No engineer should be without it.

Smooth-On Mfg. Co.,

JERSEY CITY, N.J.

FOR SALE BY SUPPLY HOUSES



Tune your ear to an

ALOXITE WHEEL

It sounds good—there is no rasping or screeching—just quiet, easy, fast grinding every minute.

A noisy wheel always denotes unnecessary friction heat, lost energy and spoiled tools. There is no economy in using such a wheel. It's always the quiet wheel that does the real work.

Aloxite is hard, sharp and tough—the ideal material for steel grinding; for cast iron, bronze, etc., there is nothing to equal Carborundum

LET US HELP YOU GET THE RIGHT WHEEL IN THE RIGHT PLACE

The

Carborundum Company

Niagara Falls, N.Y.

AGENTS:
Norman Macdonald, 145 Wellington St. West, Toronto, Can.
McLennan, McFeely & Co., Vancouver, B.C.
Williams & Wilson, Montreal, Que.
A. R. Williams Machinery Co., of Winnipeg, Ltd., Winnipeg, Man.

The Detroit Foundry Supply Co.

DETROIT, MICH. **WINDSOR, ONT.**

Cupola Blocks
Strasburg Brick
D.F.S. Crown Brick

Curtis Sand Blasts
Curtis Air Compressors
Curtis Air Receivers

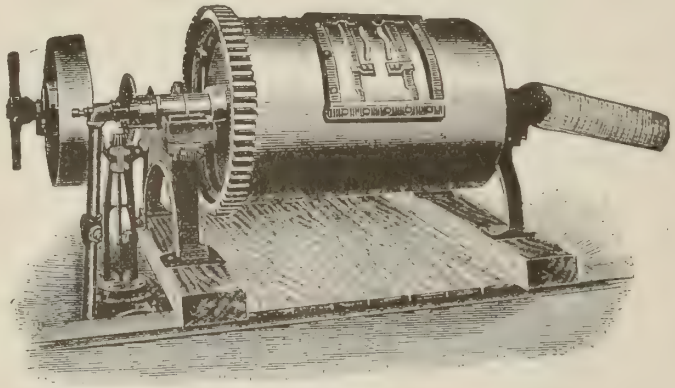
FOUNDRY SUPPLIES. PLATERS' and POLISHERS' SUPPLIES

Large stock carried in Windsor warehouse.

Prompt shipment guaranteed.

A GOLD MINE

SAVE YOUR IRON



SLY'S PATENT IRON CINDER MILL
Patented, No. 514097. Patented, No. 841728.

may be at your disposal on your very premises. Look out of your side window or back door and see if you have not an accumulation of cupola dump, and other foundry refuse, which is a total loss to you in its present state. Why not add to your profits and install one of the Sly Patent Cinder Mills to reclaim this iron and be astonished at your former loss and pocket the rich returns from your newly-discovered mine.

Sly's Patent Iron Cinder Mill will save 95% of the iron contained in your cupola dump and gangway scrapings and 75% of the coke. Iron is valuable, then why throw it in the dump? Iron recovered by this Mill is better than machinery scrap. Study economy in a foundry and your profits will increase accordingly. Mill will pay for itself three or four times every year, and we have records of Mill paying for itself twelve times a year. Let us know amount of your daily melt and we will quote. *Write for Cinder Mill Catalogue F.*

We also manufacture Cleaning Mills, Dust Arresters, Sand Blast and Foundry Equipment.

THE **W. W. SLY MFG. CO., CLEVELAND, O.**

The advertiser would like to know where you saw his advertisement—tell him.

SANDS, PLUMBAGOS, FACINGS, GLUTRIN, FIRE BRICK, AND CLAY.

THE FACT THAT WE REPRESENT IN CANADA

Pettinos Bros. of Bethlehem, Pa.

The Largest Producers of all Grades of
SANDS, PLUMBAGOS AND FACINGS

The Robeson Process Co., Au Sable Forks, N.Y.

MANUFACTURERS OF GLUTRIN

The Harbison-Walker Ref. Co., Pittsburg, Pa.

FIRE BRICK AND CLAY

Ought to be sufficient to warrant the Foundryman
to place his business with us.

F. HYDE & COMPANY

31 Wellington Street - - Montreal, Que.

James Dougall & Sons, Limited
BONNYSIDE FIREBRICK WORKS
Bonnybridge, Scotland

Best Scotch Firebricks

Special Grades for Blast Furnaces, Hot Blast Stoves, Steel Works, Brick, Lime and Cement Kilns, By-Product and Bee Hive Coke Ovens and Cupolas, Boiler Seating Blocks, Flue Covers, Dry Ground Fireclay, Foundry Ganister.

A.B.C., 5th Edition. Cables, "Ganister, Bonnybridge"

UNITED FIRE BRICK COMPANY
UNIONTOWN, PA.

HIGH GRADE FIRE BRICK, SILICA BRICK, SPECIAL SHAPES, AND DUST.

Special Brands for Foundry, Rolling Mill and Steel Plants, Cement and Lime Kilns, Glass Plants, Bee-Hive and Bi-Product Coke Ovens, Boiler Settings, Forge (oil or gas) Furnaces, etc.

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UNIONTOWN, PA.

BRANCH SALES OFFICE:
1601 Arrott Building,
PITTSBURG, PA.

Canadian Sales Agent: W. F. MARSHALL, 97 King St. West, Toronto
Long Distance Telephone Main 6054 Toronto

Detroit Solvay Coke

AVERAGE ANALYSIS

91% Carbon, 8% Ash and 65/100% Sulphur.

The analysis of contents of every car is shown on every invoice.

Insures Increased Melt
and Extra Fine Castings.

BAIRD & WEST
DETROIT

Sole Selling Agents Detroit Ovens.



Don't fail to mention this paper in writing to advertisers.

BUTTERFIELD



Taps, Dies and Reamers



On the market for 30 years. Were good tools in the beginning and have been growing better ever since.

Unequalled to-day for accuracy and durability.

Put them into YOUR shop and stop all Thread-Cutting and Reamer troubles.

Butterfield & Co.

ROCK ISLAND, QUE.
DERBY LINE, VERMONT

"MORSE" REAMERS



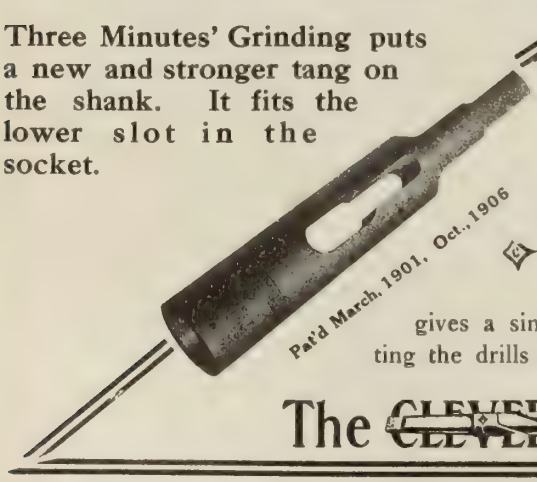
are tools of Precision. They will do your work right, being scientifically made to meet modern requirements successfully.

CARBON AND HIGH SPEED STEEL.

Morse Twist Drill & Machine Co.

New Bedford - Mass. - U.S.A.

Three Minutes' Grinding puts a new and stronger tang on the shank. It fits the lower slot in the socket.



What Do Your Twisted-Off Tangs Cost?

Keep account for a time of the new drills used to replace those thrown into the scrap heap because of twisted-off tangs, and you will see. These scrapped drills are all right in every other respect.

The "PERFECT" Double-Tang Socket

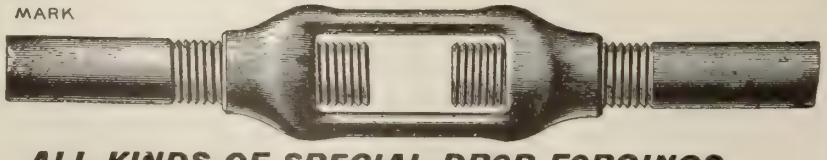
gives a simple, effective, and inexpensive means of eliminating this cost and putting the drills back in money-earning shape. **Write for Folder A.**

The ~~CLEVELAND~~ Twist Drill Co. CLEVELAND Chicago New York

B

TRADE MARK

Drop Forged Turnbuckles



ALL KINDS OF SPECIAL DROP FORGINGS
Send Models of Blue Prints for Estimates.

Machine Wrenches
Screw Drivers
Pliers
Structural Wrenches
Track "
Eye Bolts
Lathe Dogs
Etc.



Canadian Billings & Spencer, Limited **Welland, Ont.**

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To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

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To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

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General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O.
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Gardner, Robt. & Son, Montreal
Noon Universal Coupler Co., Toronto
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Canadian Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago

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Cranes, Traveling, Electric and Hand Power.
Advance Machine Works, Walkerville, Ontario
International Marine Signal Co., Ottawa
Mussens, Limited, Montreal
Northern Eng. Works, Detroit, U.S.A.
Royce, Ltd., Toronto.
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Garvin Machine Co., New York
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Mussens, Limited, Montreal

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Garvin Machine Co., New York
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Mussens Limited, Montreal.
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Tallman Brass & Metal Co., Hamilton

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Garvin Machine Co., New York

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Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton, Ont.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

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R. McDougall Co., Galt
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Springfield Machine Tool Co., Springfield, O.

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Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

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Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
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Niles-Bement-Pond Co., New York.
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Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
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Pratt & Whitney Co., Hartford, Conn.
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Drills, Track.
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Index Centres.

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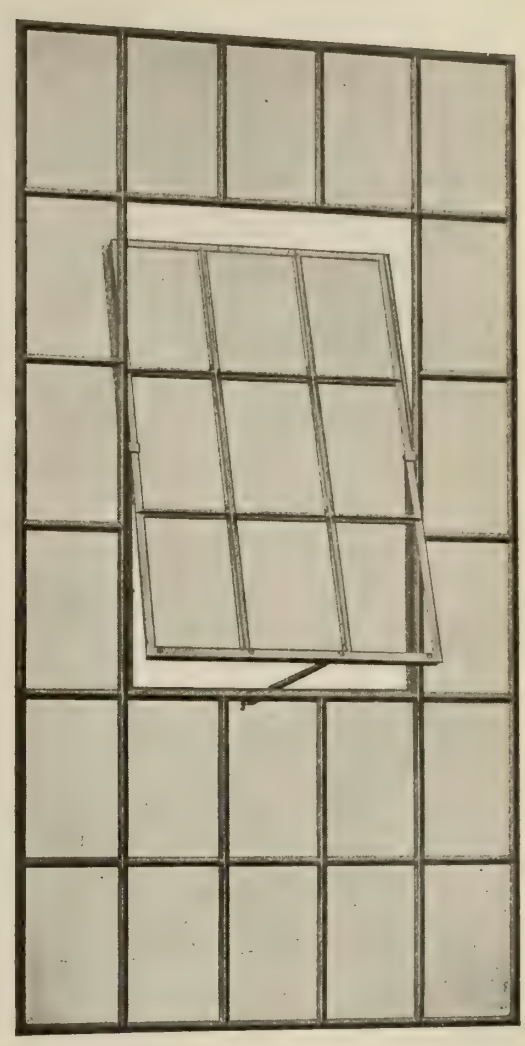
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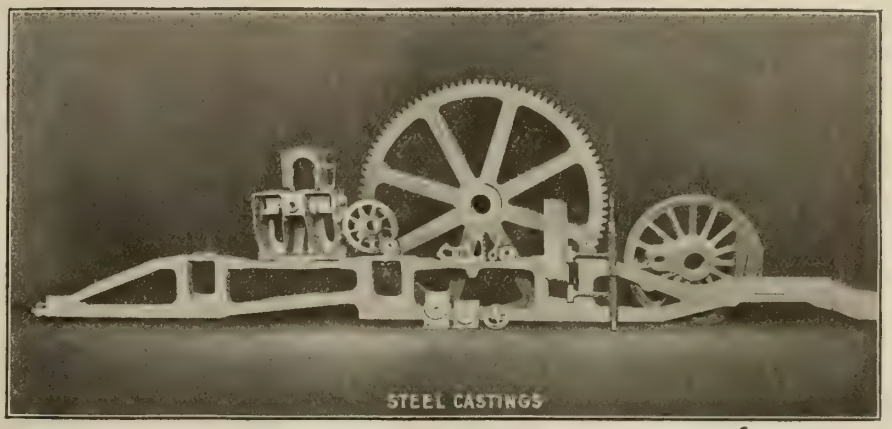
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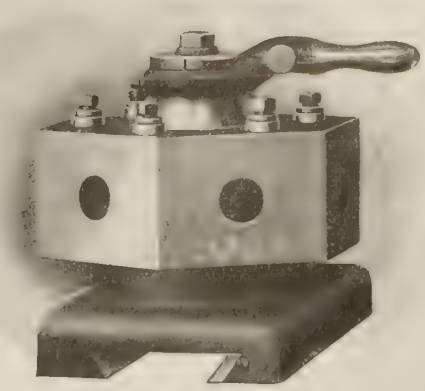
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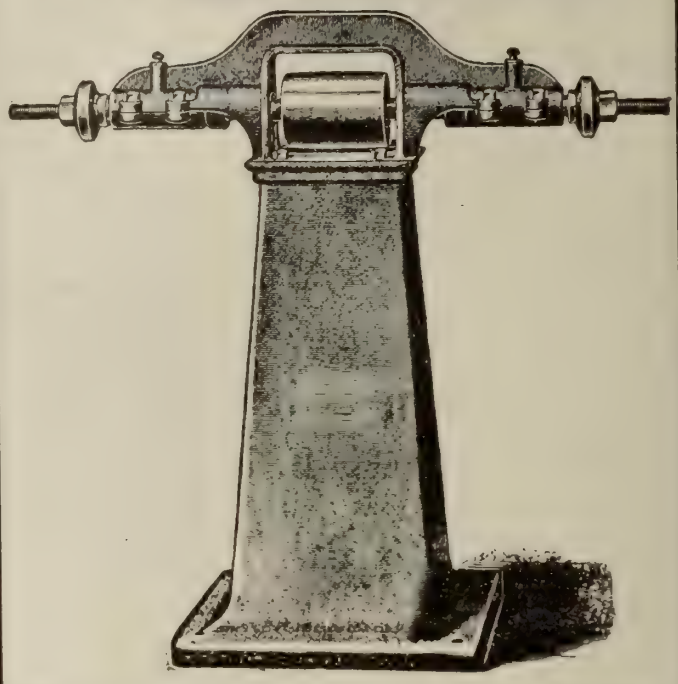


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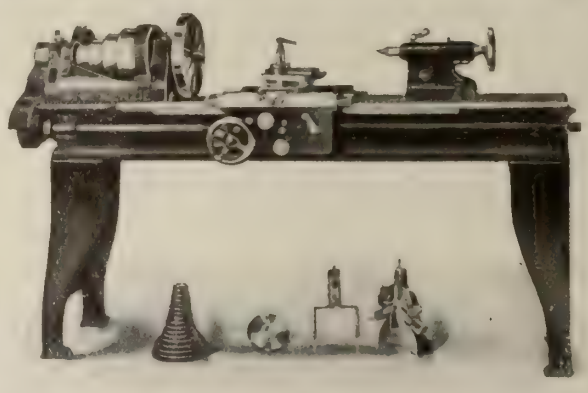
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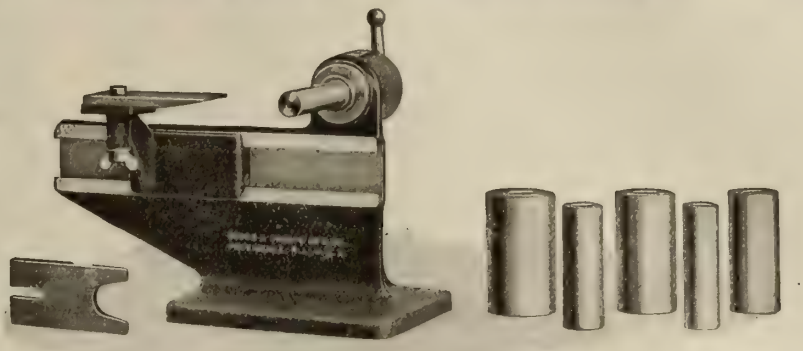
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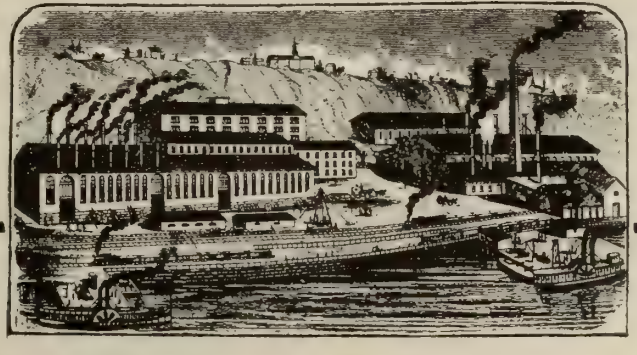
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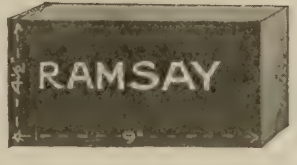
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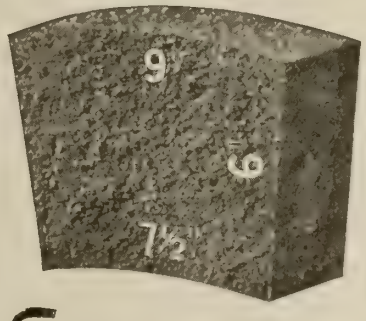
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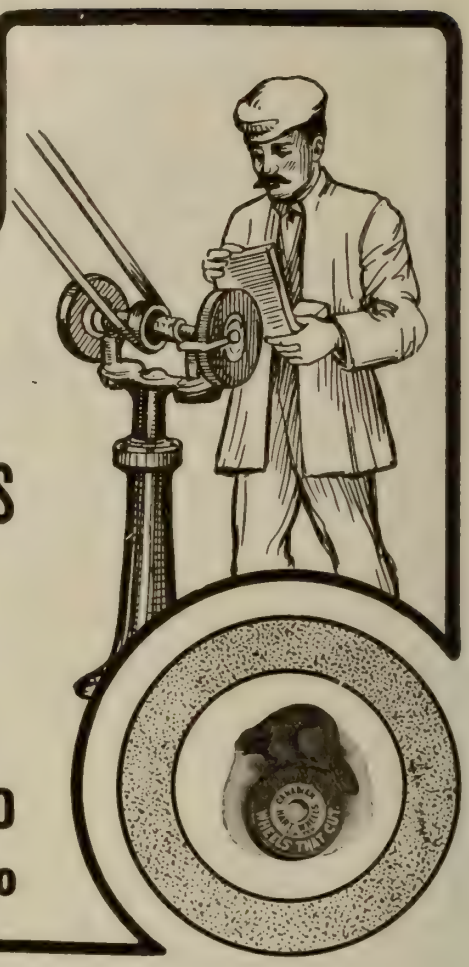
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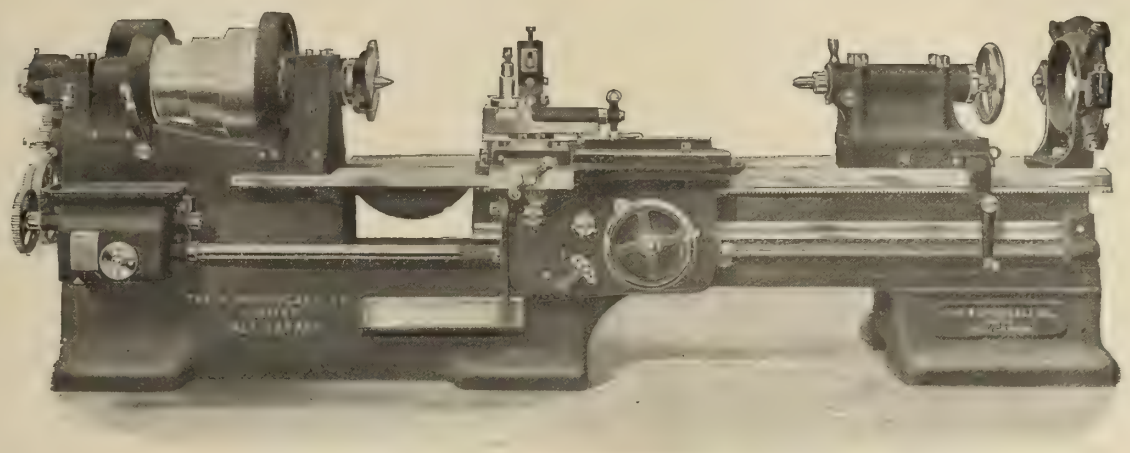
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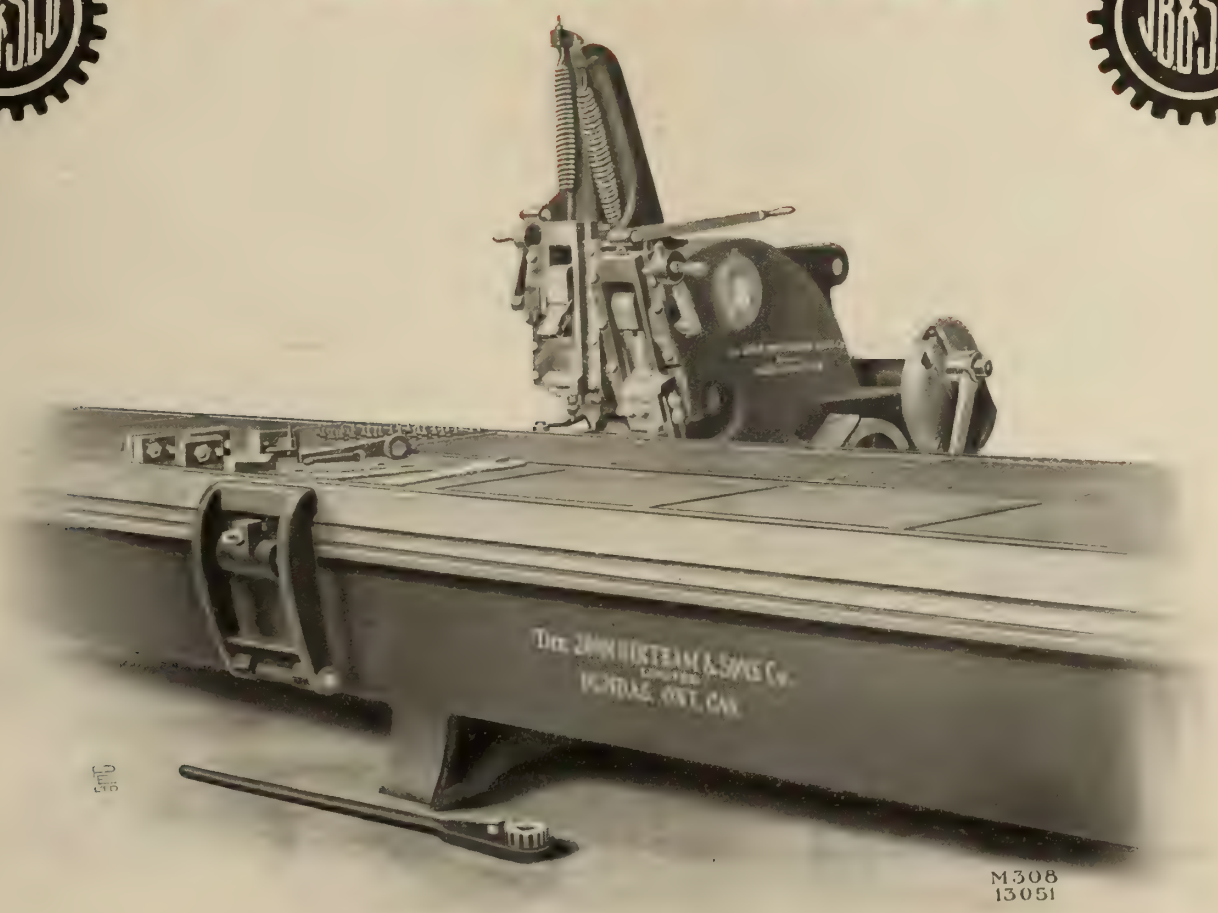
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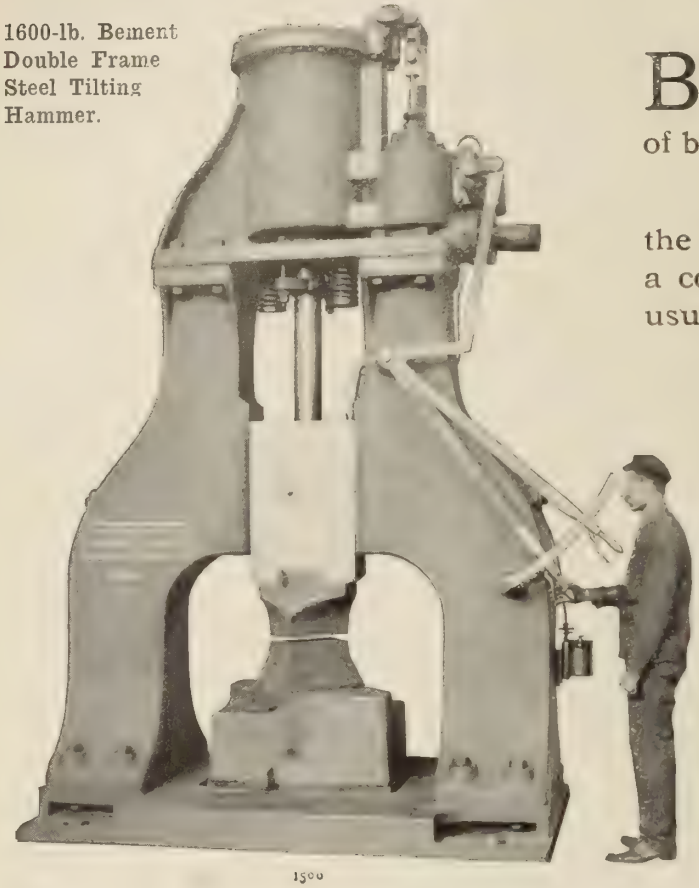
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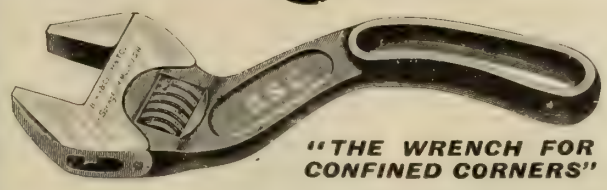
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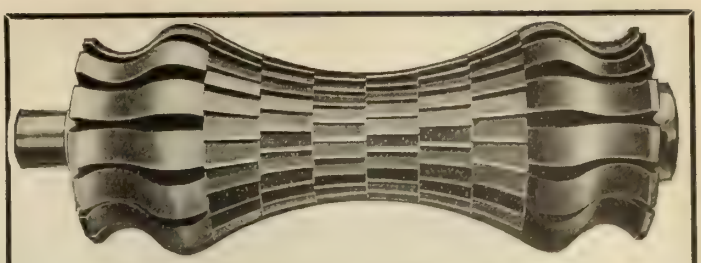
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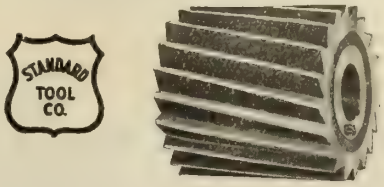
Cutters and you'll get the best results possible with your present equipment.

We make all kinds of Cutters—Regular and Special, of Carbon and High Speed Steel. Write us for prices on what you need.

SEND FOR CATALOGUE NO. 18.

THE STANDARD TOOL CO.

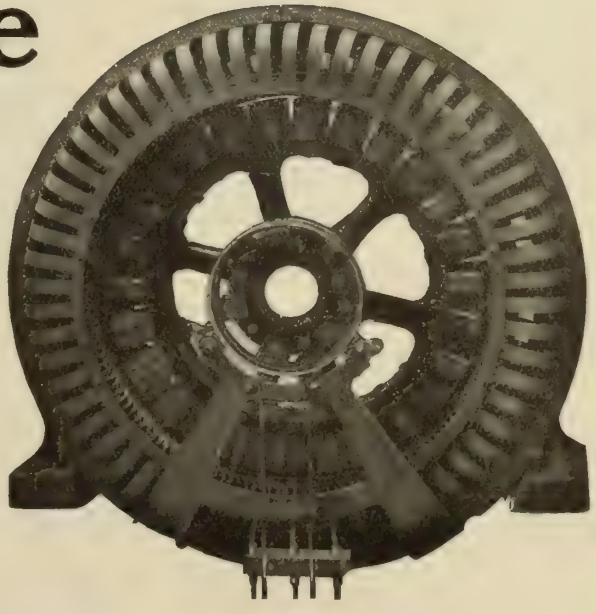
CLEVELAND, OHIO, U.S.A.—Sixth City



Westinghouse

Alternating-Current, Engine-Type Generators

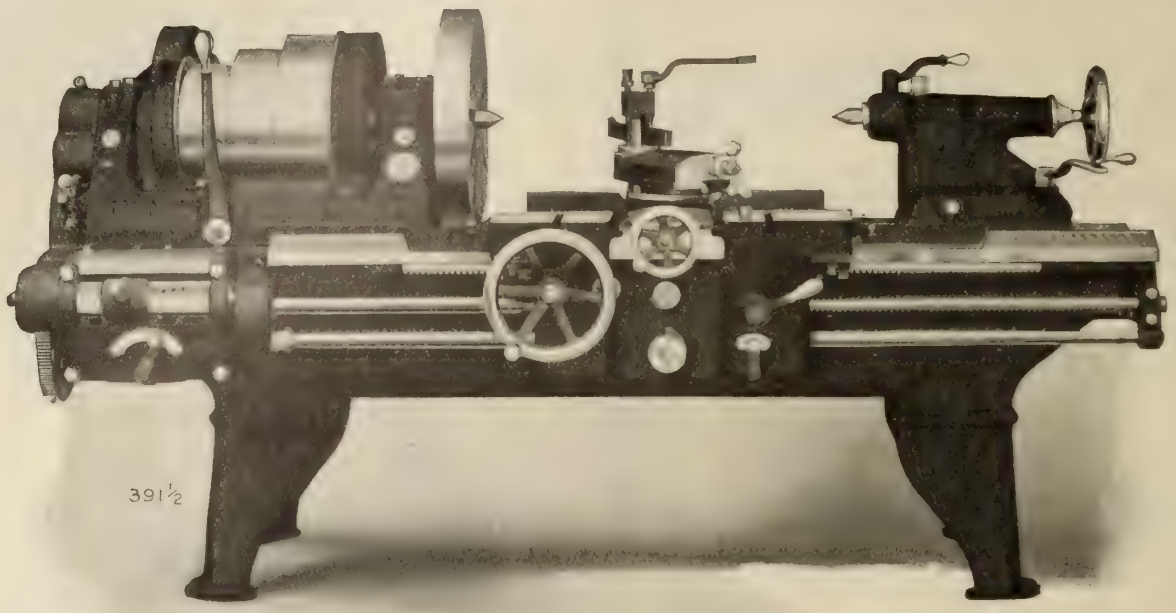
Actual service has demonstrated their thorough reliability and ability to successfully carry modern commercial loads of low power factor. They are cool in operation, have large overload capacity, and are economical to maintain.



Ask nearest office for full particulars.

Canadian Westinghouse Co., Limited, Hamilton, Ontario

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Traders Bank Bldg.	52 Victoria Square	Telephone Bldg.	158 Portage Ave. E.	311 8th Ave. West	439 Pender Street



Cost Reducing Features

An indestructible spindle bearing made of hardened steel and cast iron.

A head construction that gives more effective pulling power at the spindle than any other lathe built.

A patent "compensating V" that permits four times the bearing area between the carriage and bed found on other lathes.

A carriage in which the tool thrust is taken on a bearing the entire length of the carriage, and which positively will not climb the V.

A double-walled one-piece apron which will last as long as the rest of the lathe.

A quick change gear complete in one unit, giving thirty-six changes with two operating levers.

An offset compound rest which can be used without skinning the operator's knuckles.

The centres set back of the middle of the bed, giving greater swing over carriage and permitting the turning of work up to the maximum swing without the tool overhanging the bed.

WRITE US FOR INTERESTING DETAILS.

The London Machine Tool Co., Limited

HAMILTON, CANADA

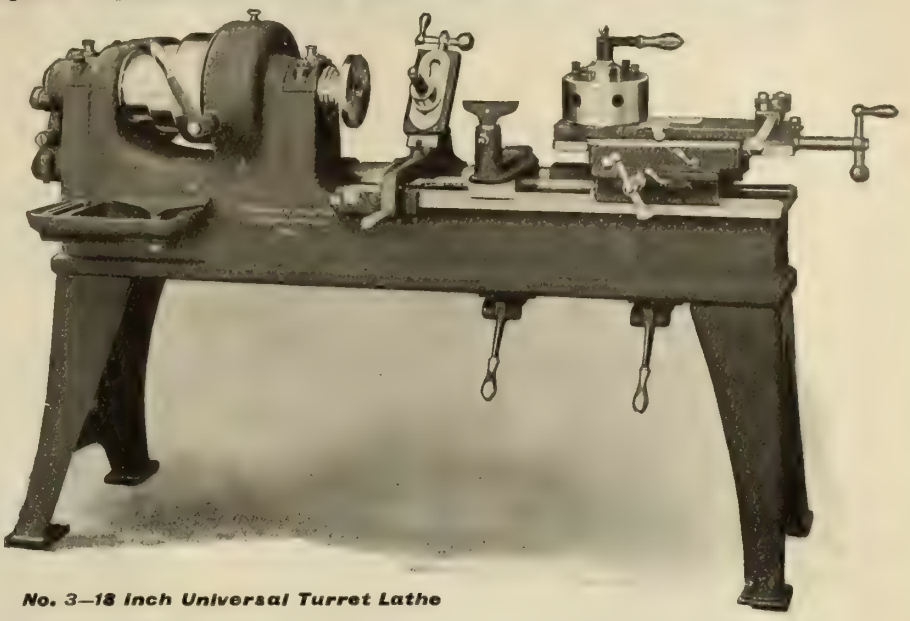
WARNER & SWASEY TURRET LATHES

For Brass and Iron Work—Complete Equipments Types and Sizes for Every Requirement

Every modern facility provided for rapid production.

The UNIVERSAL TURRET LATHE here illustrated is particularly adapted for general work.

General catalog illustrates our complete line of labor-saving, cost-reducing machine tools. It should interest all progressive manufacturers.



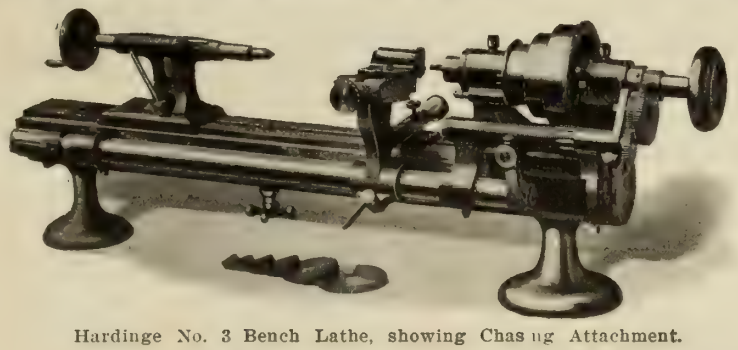
No. 3—18 Inch Universal Turret Lathe

THE WARNER & SWASEY CO., Cleveland, Ohio, U. S. A.

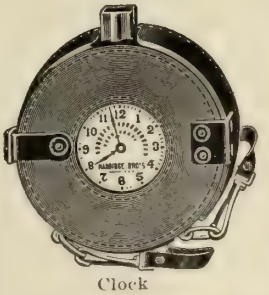
HOLLOW-HEXAGON TURRET LATHES—TURRET SCREW MACHINES—BRASS-WORKING MACHINE TOOLS

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams & Wilson, Montreal

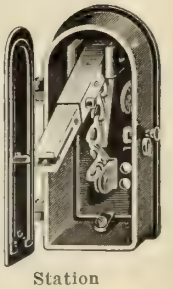
THE HARDINGE LINE



Hardinge No. 3 Bench Lathe, showing Chasing Attachment.

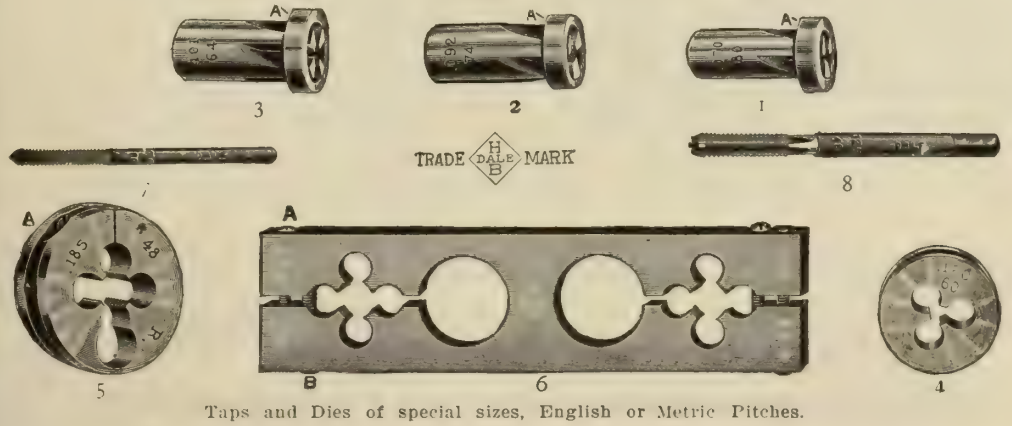


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Station

Beyer Watchman's Clock for Factories, Lumber Yards or Town Patrol.



3 2 1 8 5 6 4

Taps and Dies of special sizes, English or Metric Pitches.

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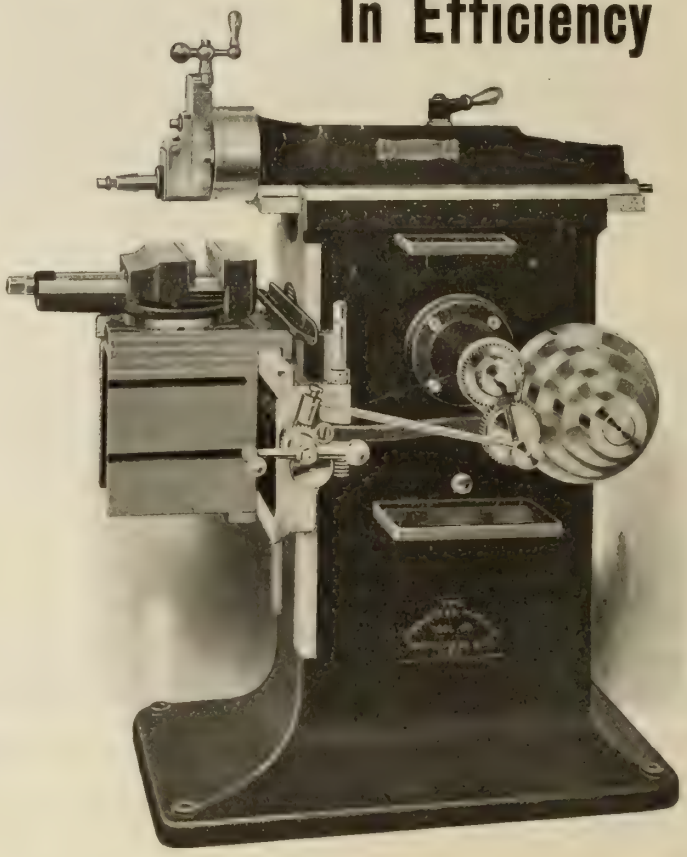
Hardinge Bros. Inc.

3133-3141 Lincoln Ave.
CHICAGO, ILL.

Canadian Agents:
The A. R. Williams Machinery Co., Limited
Toronto, Montreal, Winnipeg Vancouver and St. John, N.B.

Among The Smallest In Size But The Greatest In Efficiency

Springfield
12-Inch Crank Shaper

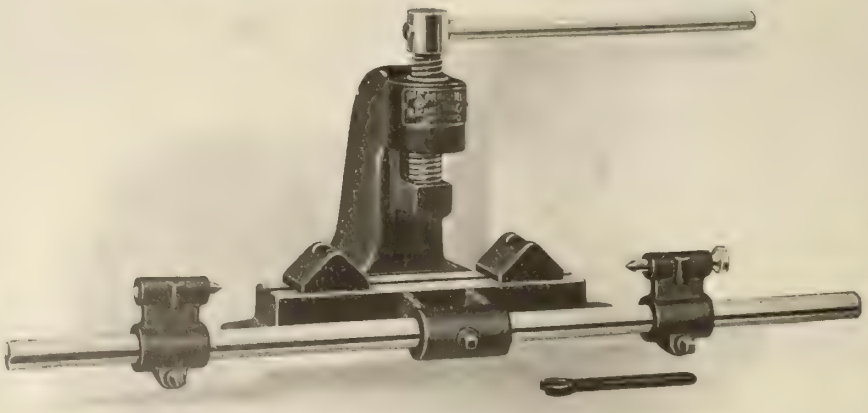


While small in stroke this Shaper is heavy and substantially built. The same care is used in its construction as is shown in any of our higher priced tools.

Nearly a quarter of a century's experience is back of Springfield Shapers. And our shapers are noted for their *simplicity*.

Consider these points about the 12-inch Crank Shaper. The vises have steel-faced jaws and a graduated circular base to permit of their adjustment to any required angle, and may be secured to top, face or side of the table. All the handles for operating the machine are placed in accessible positions, and so arranged that any adjustment, either of stroke or position of cross-rail, may be made while the machine is in motion. It is unnecessary to adjust the feed for different heights of cross-rail because it is made to adjust itself *automatically*. Write us for circular No. 111.

This Bench Straightening Press Saves Time and Energy



If you have our Bench Straightening Press you can straighten the work and test it right on the bench.

Compute the time it takes your men to carry their heavy loads from bench to lathe and vice-versa. Consider the time it takes to straighten work with a hammer, and the *loss* of time involved in testing it and perhaps carting it back again to be done all over.

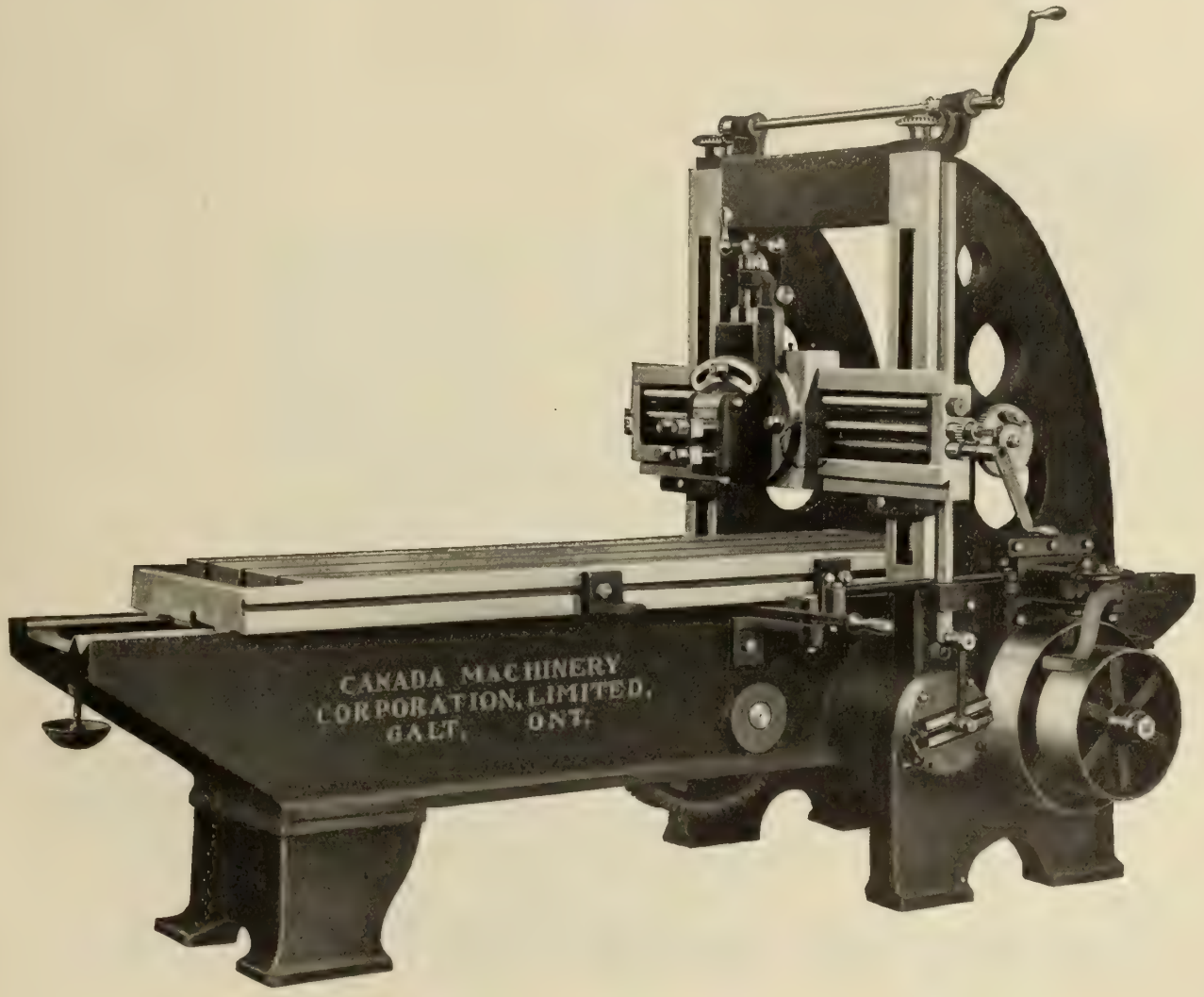
There's only *one* sensible way of looking at the question. Our Bench Straightening Press has its own testing centres, and the first straightening process is also the final. The work will be absolutely accurate and will remain so in the lathe. Straightened right at the bench. *Write for Circular No. 101.*

The Springfield Machine Tool Co.
SPRINGFIELD : : OHIO, U.S.A.

Canadian Agents, MUSSENS LIMITED, Montreal. Toronto, Winnipeg, Vancouver.

CANADA MACHINERY CORPORATION, LIMITED

GALT, ONTARIO



24 in. x 24 in. x 6 ft. Metal Planer.

We build all sizes of Iron or Metal Planers from 24 in. to 72 in., with one, two or four speed countershafts, and constant speed return. Let us have your enquiries for your Iron Tool requirements.

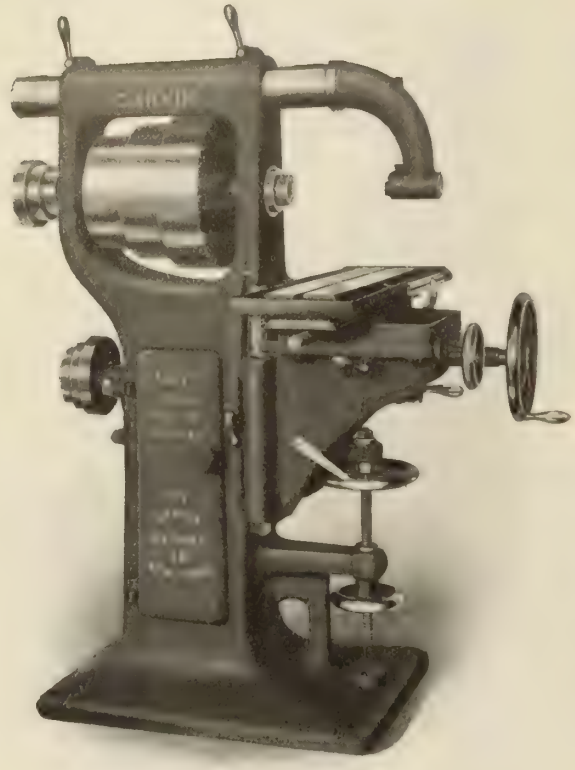
Canada Machinery Corporation, Limited

GALT, ONTARIO

GARVIN No. 21

Plain Milling Machines

PLAIN OR BACK-GEARED



No 21 PLAIN MILLING MACHINE.

Universally used by Large Manufacturers in Batteries of SIX TO ONE OPERATOR, enabling them to produce a large amount of milling at least possible cost.

The machines are well built, sold at a moderate price and will take care of a great quantity of plain or gang milling for general manufacturing. They have a No. 10 B & S taper hole in spindle with draw-in rod for arbor and are driven by a large wide face cone pulley. The table has a large oil pan all around. It is provided with a screw feed, antomatic trip and quick return by a large hand wheel which affords an easy, rapid movement. Adjustments, 18x6x13 inches.

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

IMMEDIATE DELIVERY

Send for Circular No. 153

MANUFACTURED BY

The Garvin Machine Co.

Spring and Varick Streets - - - - 45 YEARS IN NEW YORK CITY

MANUFACTURERS OF Visitors Welcome

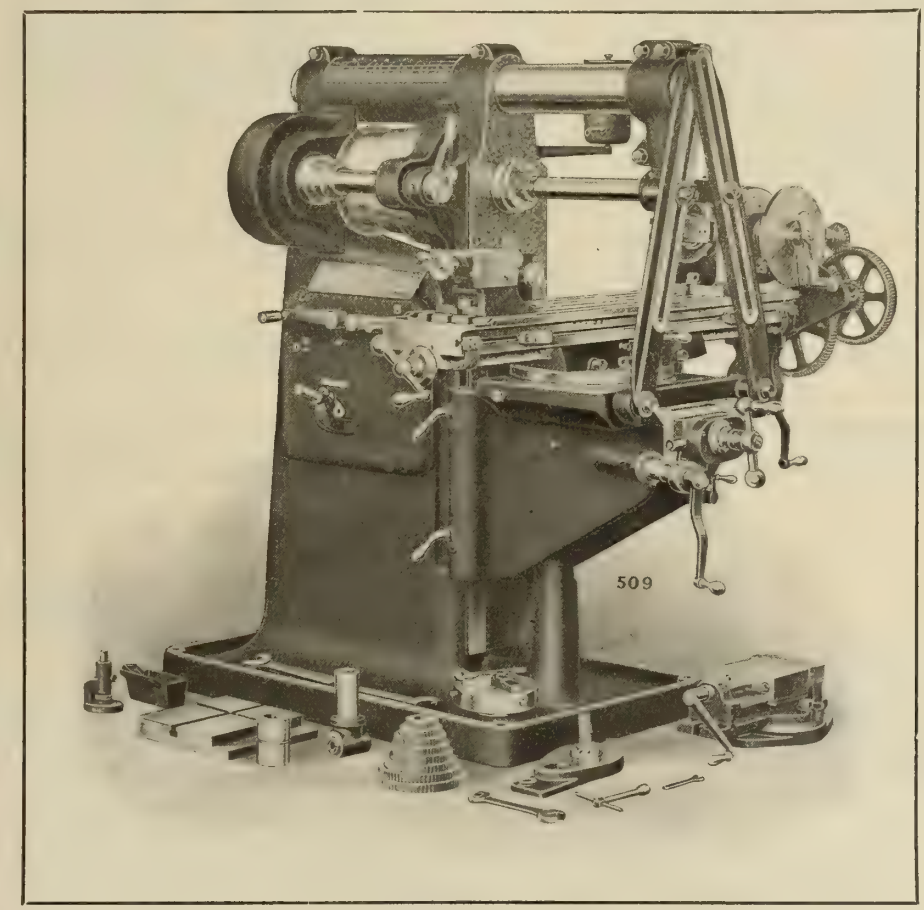
Universal, Plain, Hand, Vertical, Lincoln, Duplex, Profile and Vertical Spindle Milling Machines; Surface, Hole, Cutter and Tool Grinders; Die Slotters; Screw Machines; Monitor Lathes; Automatic Chucks; Screw Machine and Milling Machine Tools and Attachments; Automatic, Horizontal and Vertical Tapping Machines; Duplex Drill Lathes; Gang Drills; Hand Lathes; Screw Slotting Machines; Spring Coiling Machines; and Special Automobile Machinery, Etc.

Cincinnati Cone Driven Millers

IN every shop there is some work on which the cutting is light that can be milled to best advantage on a modern Cone-driven Machine. To meet such requirements we have re-designed our line of Cone Type Millers, Plain and Universal. They have many important features far in advance of other Cone-driven Millers.

The COLUMN is a complete box of rectangular form.

The FEED MECHANISM is a single unit, assembled complete by men who are specialists on this work. When in place, it is an integral part of the machine. It is located high above the floor—the operator need not stoop to reach the levers. The feed changes may be made within the pratical limits of milling while taking a cut, without inconvenience or injury to the gears, because they all run at moderate speeds.



The FEED INDEX is direct-reading—no chance for confusion or doubt as to the proper lever movements. It is the simplest index used on any machine tool.

All these features make this type the ideal machine for manufacturing small parts and for tool-room use.

We make a complete line of newly designed Millers;

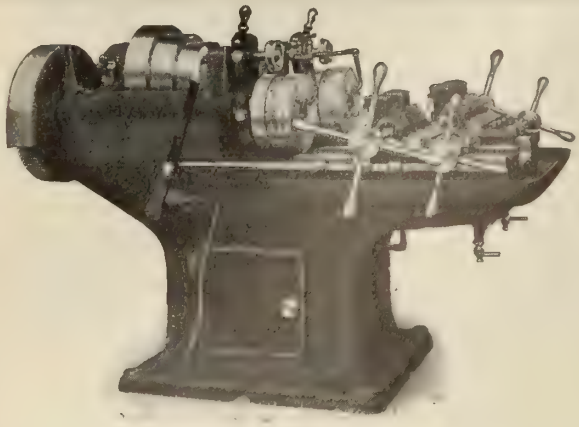
Plain, Universal, Vertical—Cone-driven, High Power

Ask for our Catalog

The Cincinnati Milling Machine Company

CINCINNATI, OHIO, U. S. A.

Canadian Agents: H. W. PETRIE, Limited, Toronto, Montreal and Vancouver



Protected by Patents

Heap's High Speed Screwing Machines

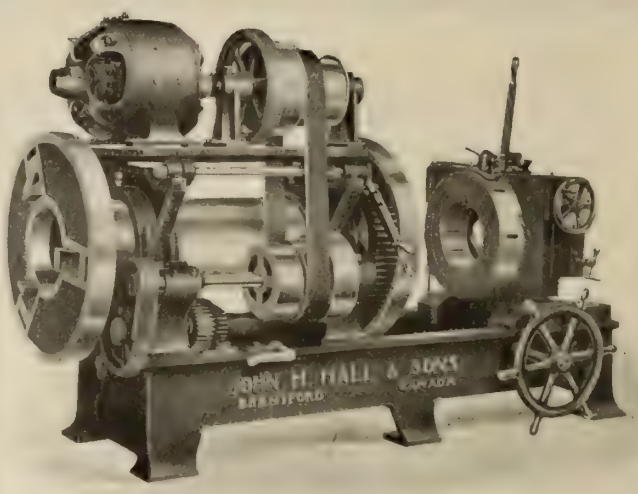
fully meet the demand for accurate and durable machines, unsurpassed in quality and containing the latest and best features for convenient operation, and large and accurate output. The perfecting of these machines did not happen at once; it took time and careful experimental preparation. Each of the new features embodied in these Screwing Machines has been under severe service and rigid test for a considerable period.

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Joshua Heap & Co., Ltd.,

ASHTON-UNDER-LYNE, ENGLAND

Canadian Agents: PEACOCK BROS., Montreal



PIPE THREADING MACHINES

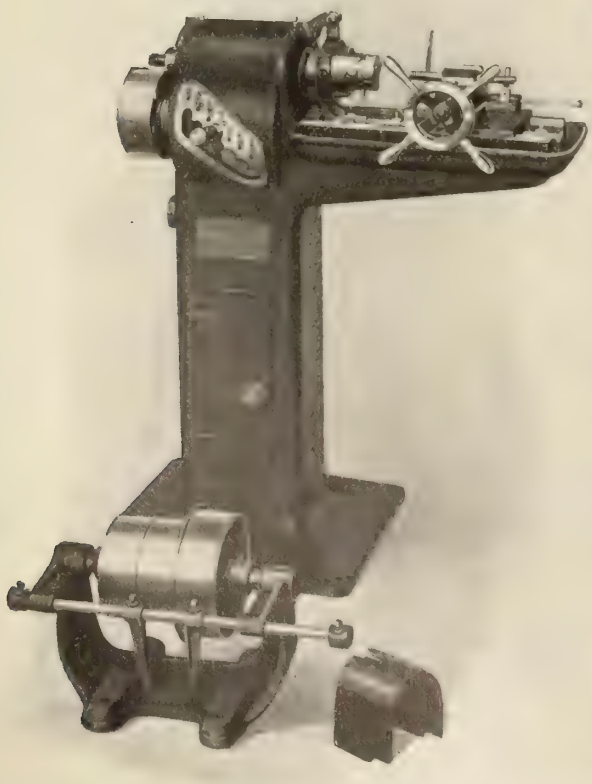
Our No. 18, Duplex Improved, equipped with Peerless Die Head mechanism.

Capacity 8 in. to 18 in., either belt or motor drive.

Write us for prices on various sizes from 1/8 in. to 18 in. Also single and double head rapid nipple machines.

John H. Hall & Sons,

BRANTFORD, CANADA



The Geometric Threading Machine

equipped with one of our STANDARD DIE HEADS, is turning out a large amount of accurate work—work that cannot be done on the usual Screw Machine, and work that cannot be economically done in any other way.

The Die Head with which this Machine is regularly fitted has a range of cutting from 1/4 inch to 3/4 inch, the sizes obtainable being 1/4 inch, 5/16 inch, 3/8 inch, 7/16 inch, 1/2 inch, 5/8 inch and 3/4 inch.

Where fine pitch threads are to be cut on larger diameters, the Machine can be fitted with a Die Head to take care of the work.

The chasers, from time to time, can be renewed at slight cost as they become worn.

Do not confuse our Machine with the usual run of Bolt Threading Machines.

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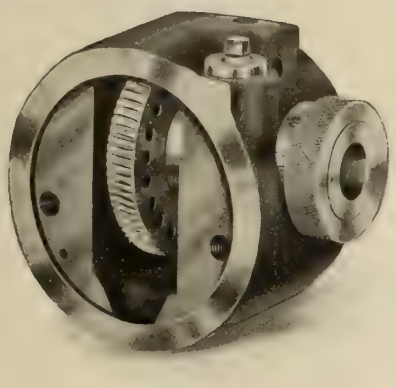
The Geometric Tool Co.

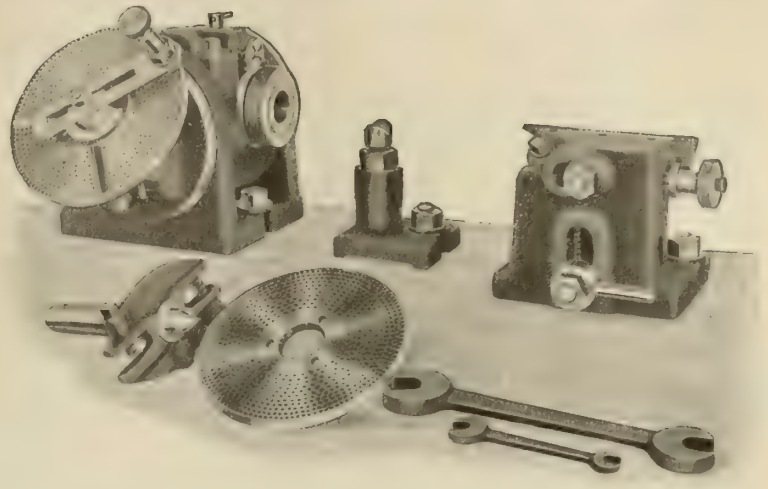
NEW HAVEN, CONN.

Canadian Agents:
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THE

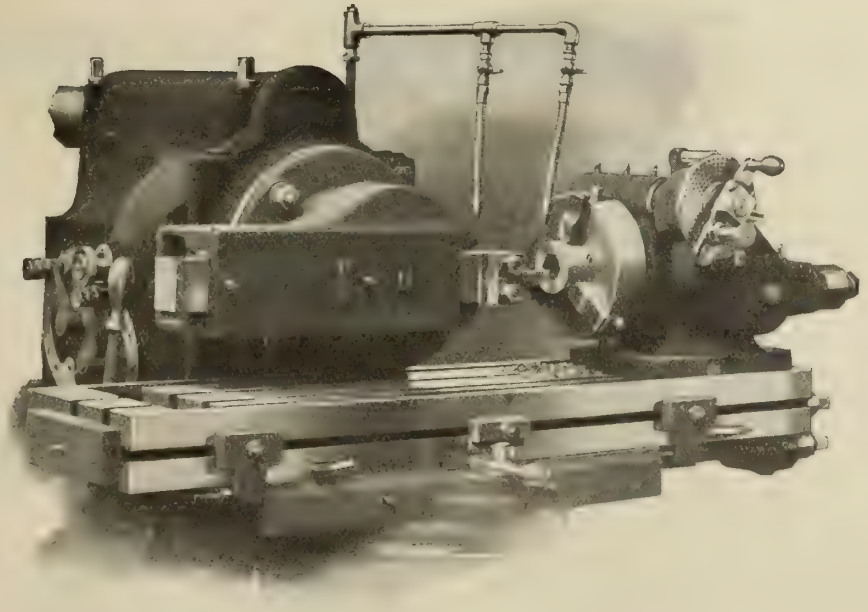
KEMPSMITH
UNIVERSAL DIVIDING HEAD





The WORM WHEEL is located centrally on the spindle, between the front and rear bearings, strictly within the head proper. Its position and very large relative size are here shown. It is 5¼ inches in diameter on the 10-inch size Head, and 6½ inches on the 13-inch size. How do we get it? Write us for description of this wonderful new Head. Regularly furnished on all our Universal Milling Machines—also separately.

The KEMPSMITH MFG. COMPANY, Milwaukee, Wis.



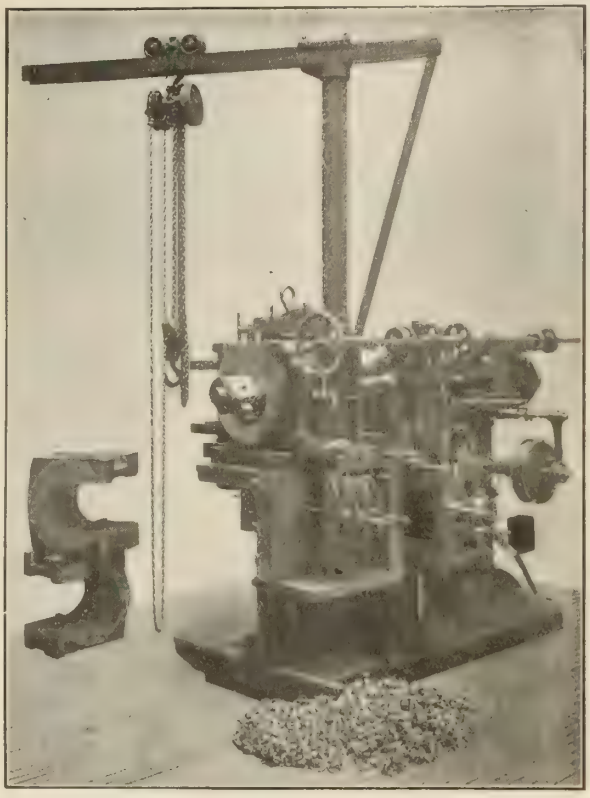
EVERY tool room should have a Milwaukee Universal Milling Machine, every universal milling machine should have a slotting attachment and every tool room foreman should have our latest book—to be had for the asking.

KEARNEY & TRECKER CO.

MANUFACTURERS MILWAUKEE, WIS.

Canadian Agents:—A. R. WILLIAMS MACHINERY CO., Toronto, St. John, Winnipeg, Vancouver
WILLIAMS & WILSON, Limited, Montreal

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

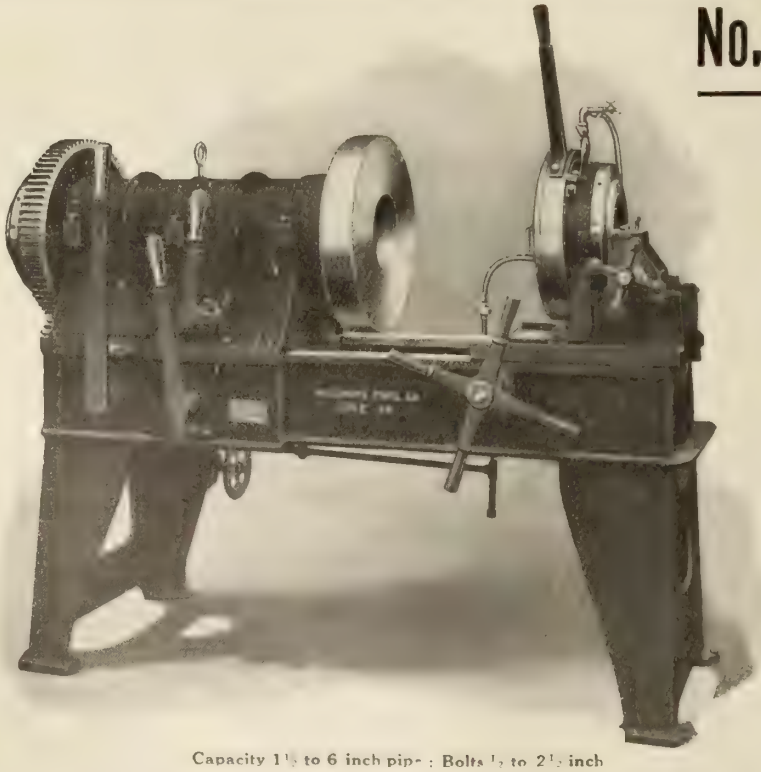
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1⅛ to 6 inch pipe : Bolts ½ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼″ to 2″ ; ½″ to 3″ ; 1″ to 4″; 1½″ to 6″ ; 2″ to 8″ and 3½″ to 12″.

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

Sold by the

A. R. Williams Machinery Co., Limited

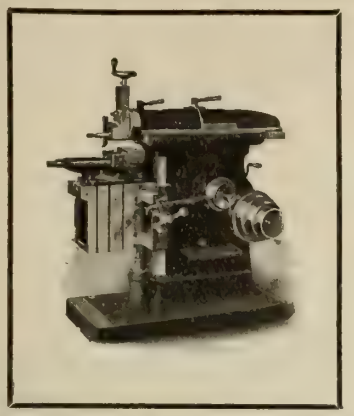
Toronto Montreal St. John Vancouver and Winnipeg

Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

The advertiser would like to know where you saw his advertisement—tell him.



The Shaft Bearings in

STEPTOE SHAPERS

never wear out. They are provided with bushings that can easily be replaced if necessary, and Ring Oilers keep the bearings constantly flooded in oil, thereby preventing the shafts from getting hot and cutting. The Bull Gear Bearing has a chain oiler, and a number of other features (which we cannot explain here) make STEPTOE SHAPERS "just a little better."

The John Steptoe Shaper Co.

1953 Jessamine Street - - - - CINCINNATI, OHIO

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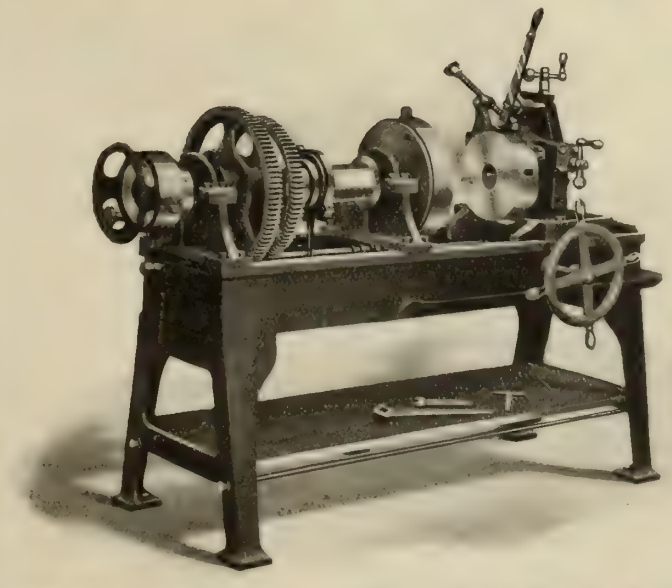
Hydraulic Power Screw Any Pressure Any Size

WRITE FOR FULL PARTICULARS

The Canadian Boomer & Boschert Press Co., Ltd.

18 TANSLEY STREET, : : MONTREAL.

B. & K. Pipe Machines



will begin to save money the moment you put them in. They are built for rapid, accurate and economical pipe cutting and threading. Adjustments are easily made with the Peerless Die Adjusting Mechanism. No matter how severe the duty required of them, they are always ready.

Get Our Catalog.

BIGNALL & KEELER MFG. COMPANY

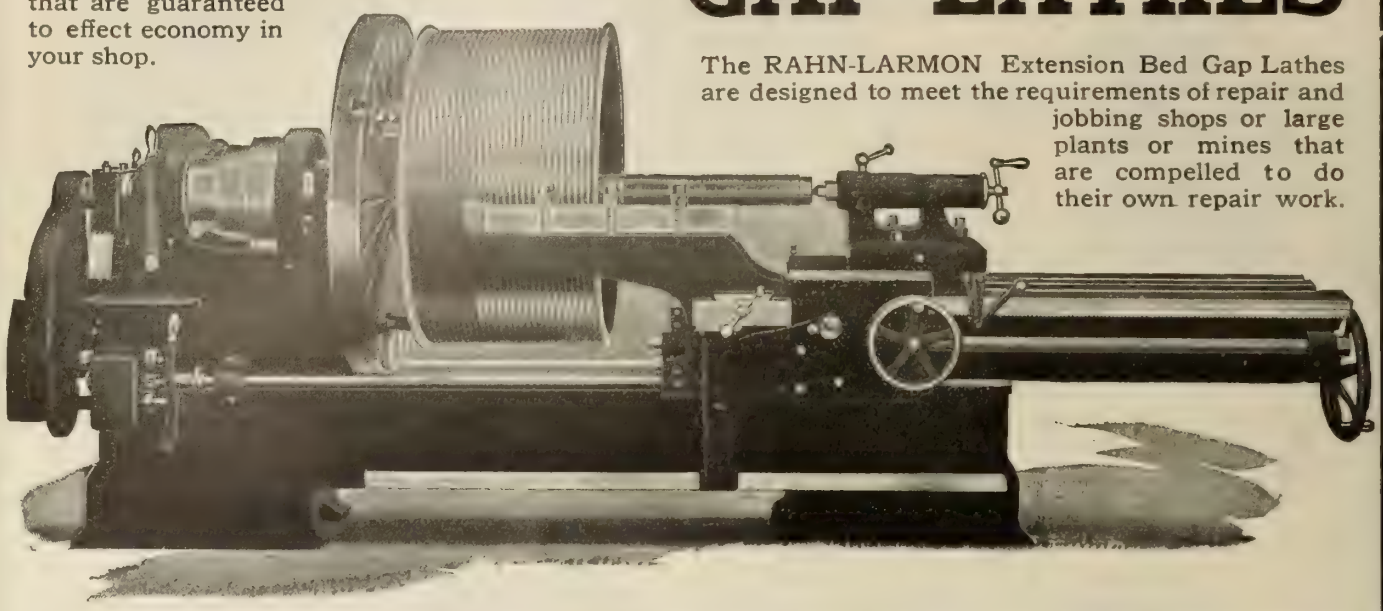
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Selling Agents for Canada—Canadian Fairbanks Co., Ltd., Montreal, Toronto, St. John, N.B., Winnipeg, Calgary, Vancouver

GAP LATHES

Write for catalogue of complete list of Lathes that are guaranteed to effect economy in your shop.

The RAHN-LARMON Extension Bed Gap Lathes are designed to meet the requirements of repair and jobbing shops or large plants or mines that are compelled to do their own repair work.



This cut represents our 24x48 in. Extension Bed Gap Lathe, which is practically THREE Lathes embodied in ONE machine.
The top bed slides along the lower one, and can be adjusted to any width of gap required within range of the lathe. By moving the upper bed, the distance between centers can also be considerably increased.

THE RAHN-LARMON CO.

CINCINNATI, OHIO, U.S.A.

POWER PUNCHING AND SHEARING MACHINERY

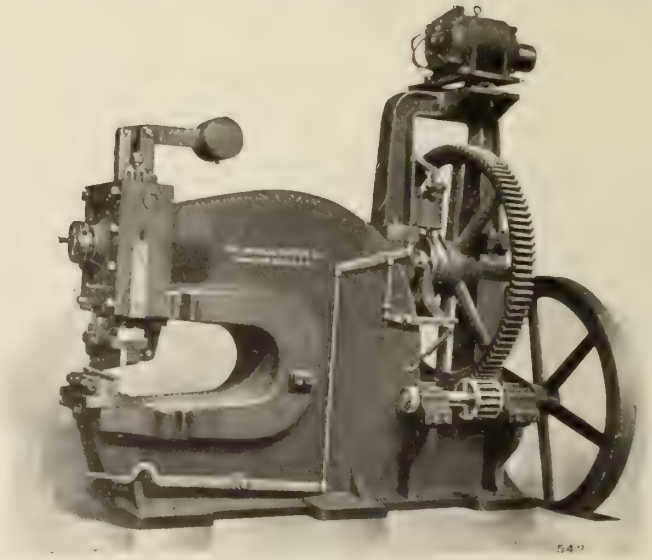
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications.



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

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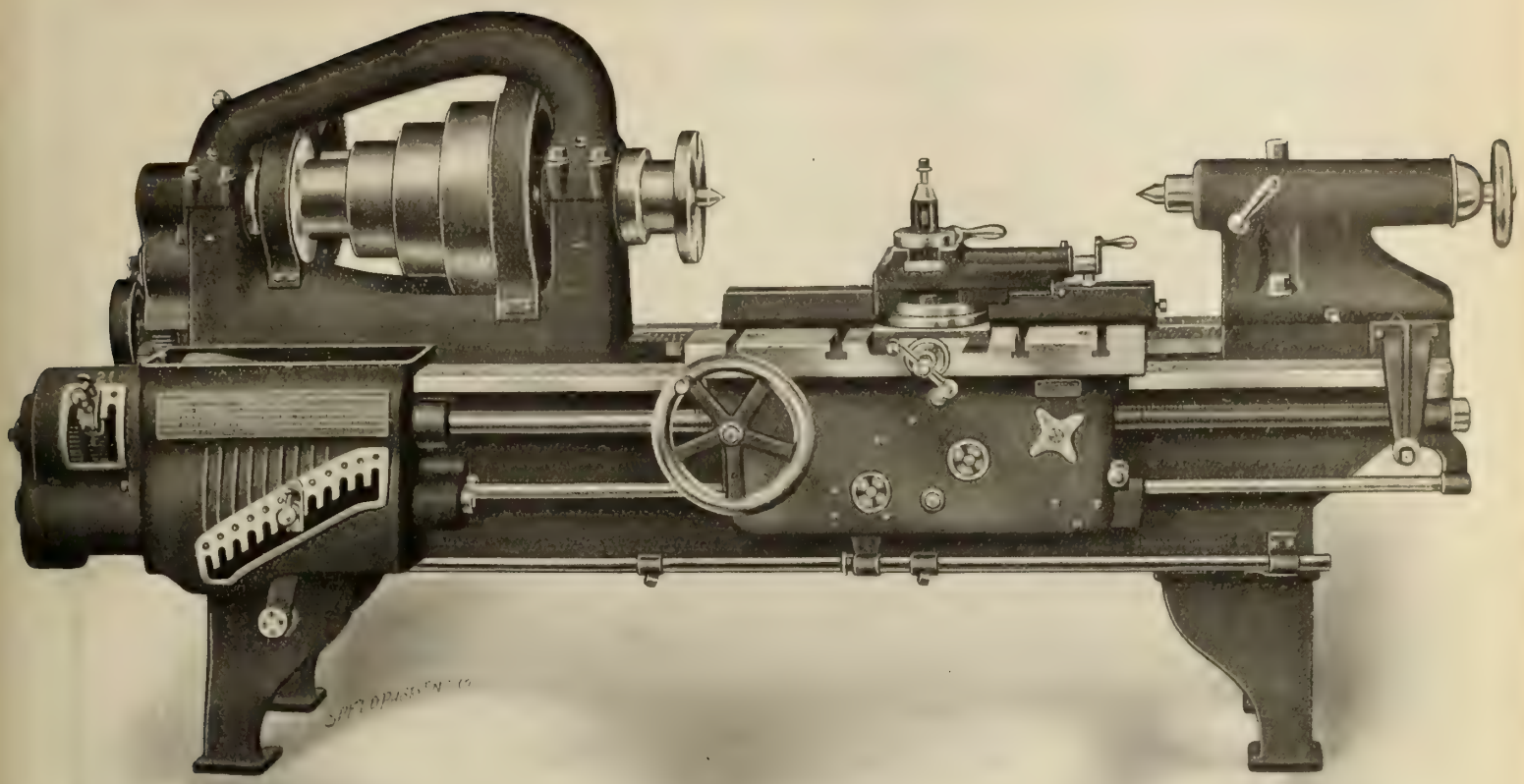
Bending and Forming Machines.

Drop and Helve Hammers, Etc., Etc.

Designed and Manufactured by

THE LONG & ALLSTATTER CO.

Hamilton, Ohio, U.S.A.



Hendey 24-inch Improved Engine Lathe

IT has taper journals for spindle, annular bearings for same, and lubrication controlled by ring oilers. It has mounted change gearing, giving 36 different threads and feeds. Threads not shown on index, including metric pitches, can be cut with the aid of a few extra change gears. It has automatic stop for carriage in either direction. Reversing travel controlled by lever located at right hand end of apron, allowing the spindle to run in one direction. Carriage is heavy and substantial but has remarkably easy traverse along bed by means of hand wheel. This easy movement appeals to the operator. Workmanship and accuracy of our machines guaranteed to be the very best.

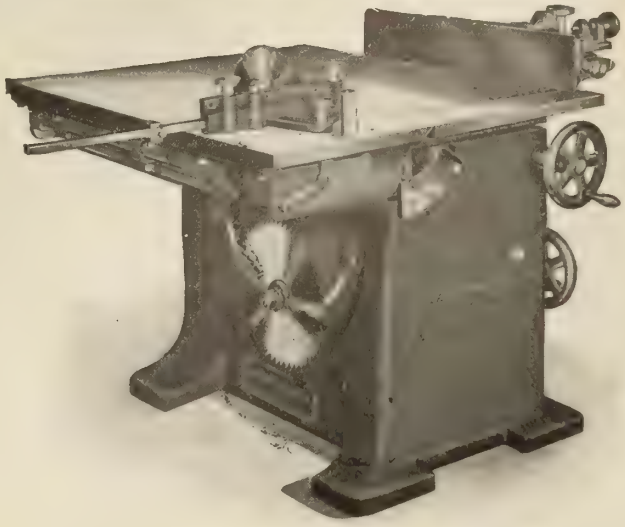
Send for complete catalogue illustrating all sizes, including Geared Head Lathes

THE HENDEY MACHINE CO.

TORRINGTON, CONN., U.S.A.

A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal, Canada; General Supply Co. of Canada, Ottawa, Ont.

HAVE YOU EVER SEEN A NO. 205?



No. 205. Double Circular Saw.
Patented Jan. 26, 1908.

If you did, you know it's the finest saw ever built for pattern shops.

There is so much to tell about this machine that we have gotten up a special booklet about it. You are entitled to a copy and it will be sent upon receipt of your name and address.

Built like a machine tool throughout, but in such large lots that the price is right.

Don't forget to write for the book.

J. A. FAY & EGAN CO., 362-382 W. FRONT STREET, CINCINNATI, - OHIO.

One Machine That Replaces Two Others and Does the Work of Either in Less Time

On all Face Plate Work Within Its Range

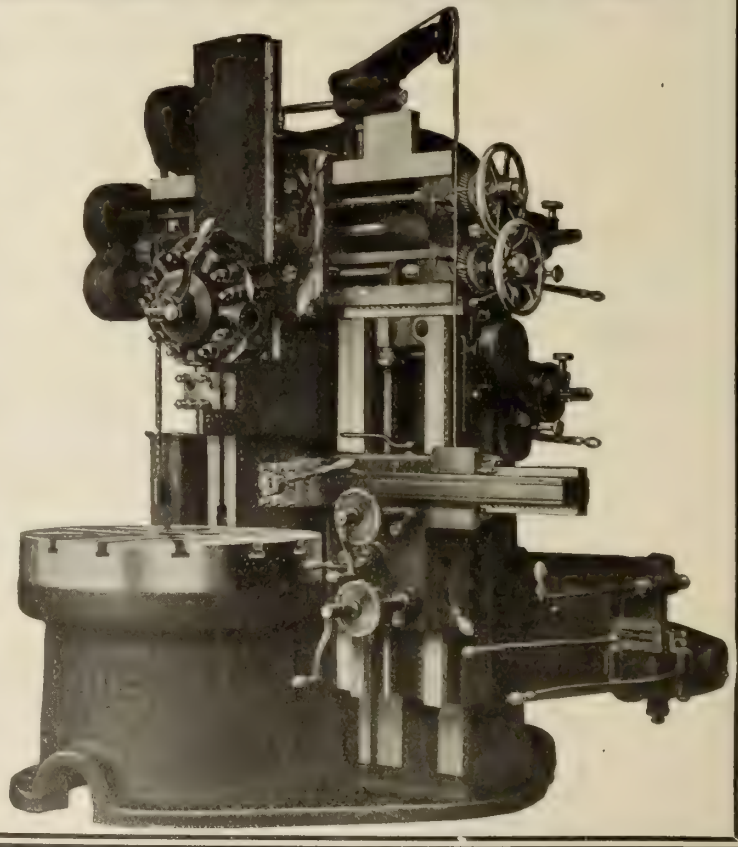
On all work within its range, the Vertical Turret Lathe replaces both the Vertical Boring and Turning Mill and the Horizontal Turning Lathe. It ***combines*** their good features. Thus it takes the place of either one of them with all the valuable features of the other ***added.*** But in combining the two, other features were developed which are exclusively the Vertical Turret Lathe's. Like a boring mill, it is heavy and rigid, capable of doing heavy cutting. Like the horizontal turret lathe, its turret provides a means of holding tools in instant readiness for a sequence of operations.

Unlike either of them, it has a Side Head for more tools, which can be brought into use simultaneously with those in the Main Head—Multi-cutting.

Unlike the horizontal machine, there is no overhang of the work—the alignment of table spindle is self-preserved.

Unlike the boring mill, the ***control is centralized*** —time-wasting steps are eliminated. The similarities show that the Vertical Turret Lathe does all the work within its range, as well as ***both*** these machines.

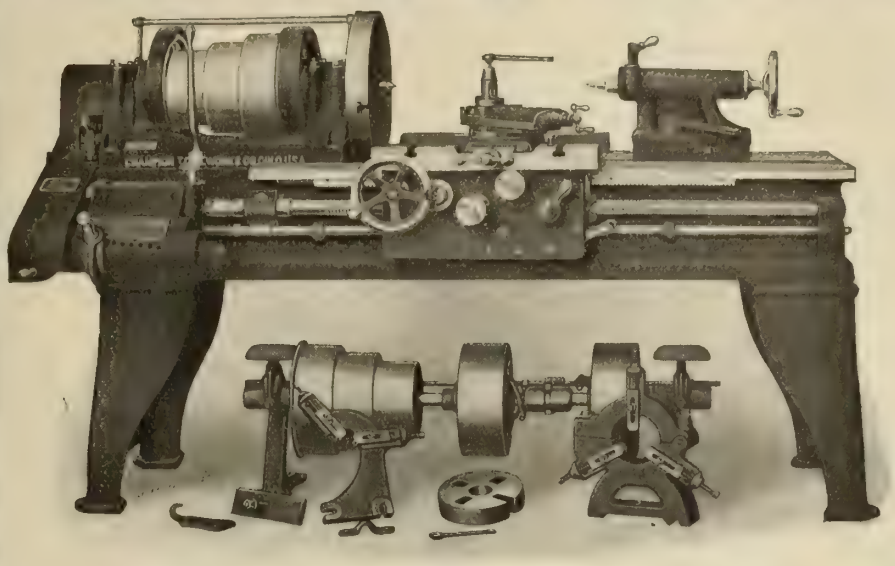
Let us send you our interesting Treatise on Face Plate Work C-15—Free. It has the details.



The Bullard Machine Tool Co.
BRIDGEPORT, CONN., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

Without Stopping You Can Make All Changes



16-in. Quick Change and Double Back Gear Lathe.

ON THE

CHAMPION

A Double Back Gear on your lathe will be of little value unless you can change from Single to Double Back Gear and vice versa without stopping the lathe, as it takes too long to make the adjustments for the change.

Our New Patented Positive Clutch Double Back Gear on this 16-inch Lathe admits of three Rapid Changes, and is the lathe you want to see before ordering elsewhere.

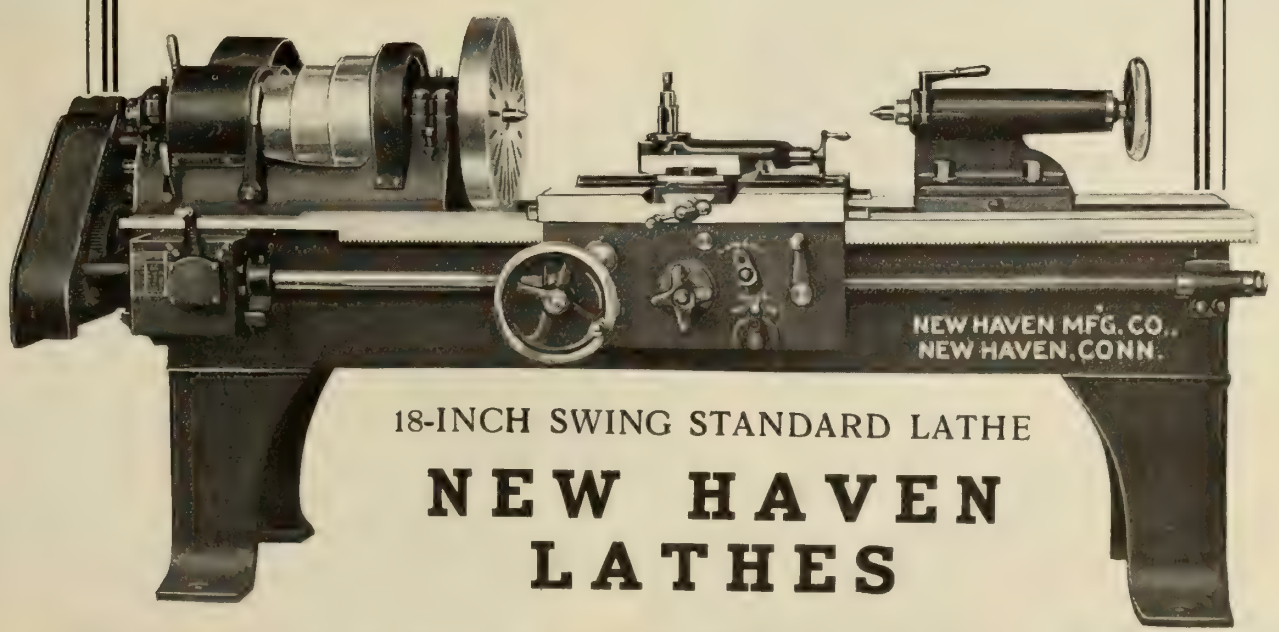
Also the **Quick Change of Feeds and Threads** is not conditional on your taking off, putting on, or reversing any of the gears or parts to obtain the full range of changes.

Write us for Catalogue of the Quicker and Better Way.

10, 12, 14, 16, and 18-in. Lathes; Quick Change or New Standard, with or without Taper Attachment, Draw-in Attachment, Turrets, etc.

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.



18-INCH SWING STANDARD LATHE

NEW HAVEN LATHES

We furnish these Lathes with beds from 8 to 20 feet long, varying by two feet, and usually have in stock for prompt delivery Lathes with 8 to 16 feet beds. Beds are strongly braced, and are cut through at the rear end so that tail stock can be removed by sliding the end. Regular equipment includes complete friction countershaft with self-oiling boxes, center rest, follow rest, full swing rest, large and small face plates, and drop-forged wrenches. Machines are inspected and thoroughly tested before leaving our works. Material and workmanship are guaranteed.

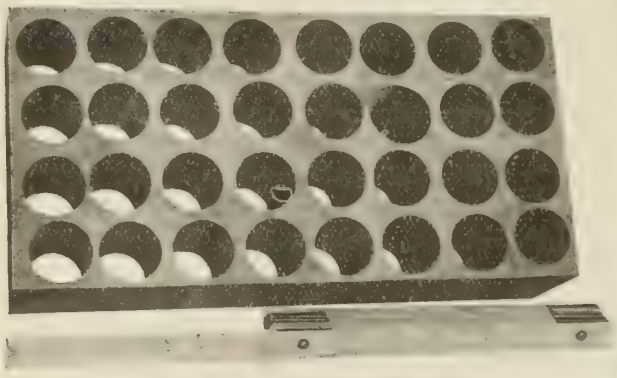
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New Haven Manufacturing Co. - New Haven, Conn., U.S.A.

No One Wants to do this in Actual Manufacturing

but it demonstrates the remarkable ability of our

Model "A" Hi-Speed



8 Ft. of 1¼" Hole in Cast Iron
Removing 31 Lbs. of Metal

Time, 17 Minutes

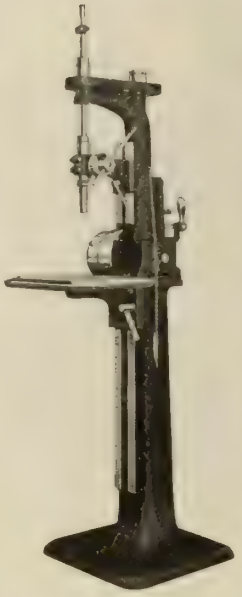
Sibley Machine Tool Company

Church Lane

South Bend, Ind., U.S.A.

Manufacturing Drilling Machines

OF HIGHEST EFFICIENCY



16 SIZES, 5 TYPES

FOR DRILLING HOLES ¾ INCH AND UNDER

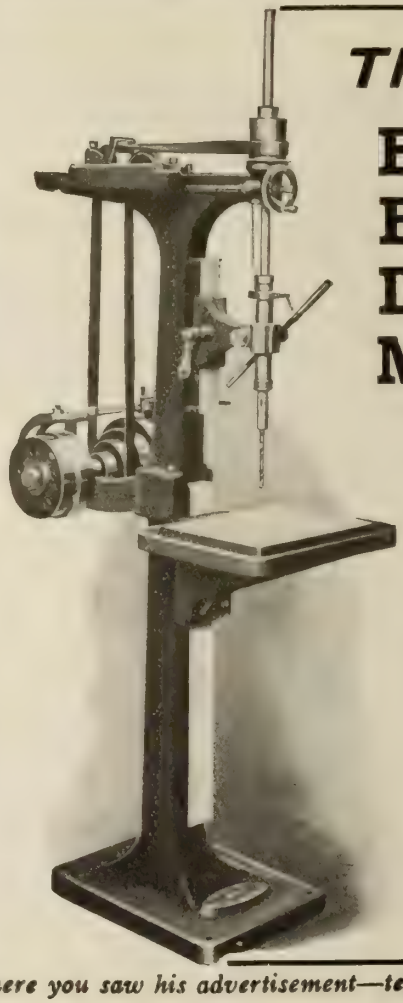
They have rigidity for heavy work and power to drive high speed steel drills to the limit of endurance.

Compact in shape, only the minimum floor space is required; silent chain and positive gear drive replace the usual belts; every operating convenience to save time and labor.

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THE TAYLOR & FENN COMPANY

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The AVEY

Ball Bearing Drilling Machine

will give you

Greater Production at Reduced Cost

because it can be run at higher speed than other machines, and it is the quickest, simplest and easiest adjusted.

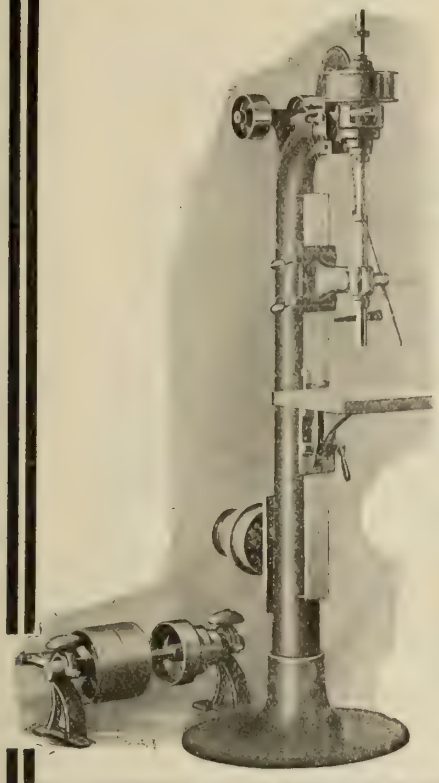
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Built in single and multiple spindles. Various sizes.

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CINCINNATI

Increase YOUR Output! Save Money!



Install a "BARR"

Combined Drilling and Tapping Machine

With it you can do better drilling and better tapping, and do them quicker than two separate machines, and at the same time save much space and capital investment.

We can also give you power feed, lever feed, and tappers in any combination from two to seven spindles to a machine.

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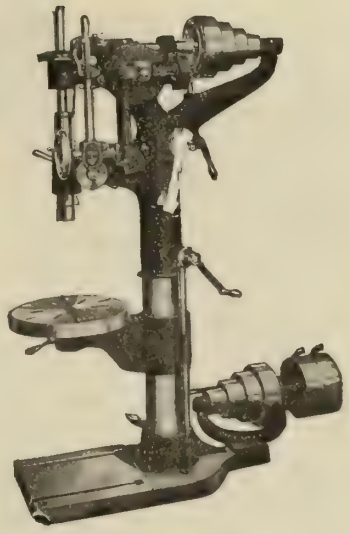
H. G. BARR, Worcester, Mass., U.S.A.

WILLIAMS & WILSON, Montreal—Agents for Eastern Canada

The General Supply Co., of Canada, Ltd.

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The BARNES DRILLS



Complete line. 8-inch to 50 inch swing.

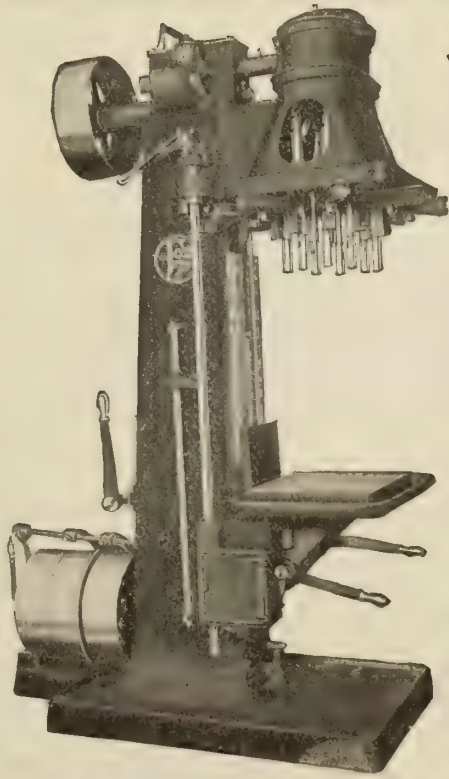
Gang Drills.—Horizontal Drills.

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104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO.
Toronto, Montreal, Winnipeg, Vancouver, St. John, N.B.



FOX Multiple DRILLS

Steel Castings are being used more to-day than ever before. The **FOX** full gear driven Multiple Drill is the machine you need to drill these castings at the lowest possible cost.

We build machines for circular, rectangular or irregular lay-outs, and for drills up to 1½ in. diam.

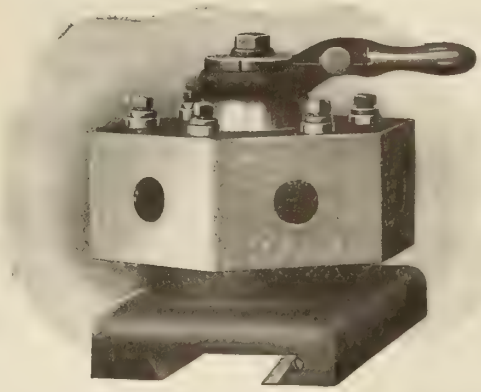
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FOX Machine Co.

23 N. Front Street, Grand Rapids, Mich.

Canadian Representatives: The A. R. Williams Machinery Co., Limited 95-97 Front Street, Toronto, Ontario

Engine Lathe Transformed Into a First-Class Turret Lathe.



Our improved Lathe Turrets will greatly increase the capacity of your Engine Lathes and save their cost in a surprisingly short time. They embody original and patented ideas, and can be furnished in several styles and sizes for lathes of any make.

Style O, illustrated, is extra heavy, with hexagon head. Has taper pin for locking to carriage in a position always in line with the lathe spindle. When work is to be faced up with turret, this pin can be withdrawn.

Want our Illustrated booklet?

FAY & SCOTT - Dexter, Maine

Complete line of Standard Engine, Extension Gap and Patternmakers' Lathes, Planers and Shaper Centers.

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Extra Long Taper-bearing. Adjustable Steel Toe.

Bearings Protected to Prevent Grit or Dirt Getting in.

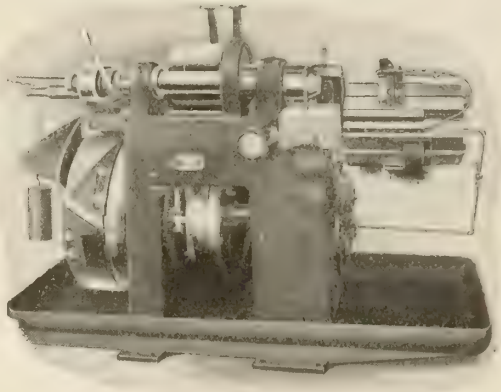
Ample room for deep box. **New and approved design.**

Pendrith Machinery Company

Manufacturers

970-972 Queen Street West - - Toronto

"Gridley" Automatic TURRET LATHE



"GRIDLEY" SINGLE SPINDLE

For Rapid, Convenient and Economical Service

Work of greater length and more complex character than usual can be easily accomplished with the "GRIDLEY" Turret Lathe.

It differs from all other automatics in the manner of supporting the tools, and in the arrangement of the tool holders on the tool slides of the turret.

On all other automatics there is an overhang of the tool. This overhang prevents the performance of accurate work, because the method of supporting the tools does not permit as heavy cuts or as coarse feeds.

Saves time and money, as one operator can attend to several machines at once, and can use tools tandem on each machine when rapid production is necessary.

"GRIDLEY" Automatics assure greater accuracy, larger output and wider range of work.

We manufacture both Multiple Spindle and Single Spindle Automatic Lathes. **Write us at once for particulars.**

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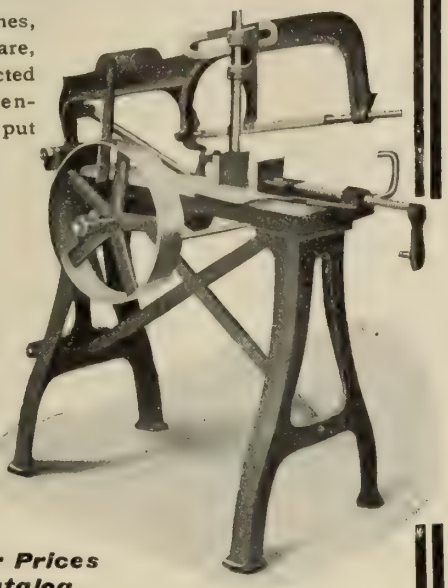
Manning, Maxwell & Moore, Inc., Agents for United States and Canada. Craven Brothers, Ltd., Manchester, England, Manufacturers and Sole Agents for Great Britain and Colonies. M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany, Agent for Germany, Belgium, Italy, Holland, Switzerland, Austria-Hungary. Office for France, 68 Avenue de la Grande Armee, Paris, France. J. Ryan, Manager.

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IMPROVED POWER HACK SAW

The high efficiency and durability of this machine is the direct result of the superior grade material used, and the employment of skilled workmen.

It cuts bars 6x6 inches, either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.



The **Improved Saw Guide** is worthy of your special notice, as it keeps the saw perfectly in line at all times.

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D. McKenzie, Guelph, Ont.

Valley City No. 3

This Tool and Surface Grinder has an unequalled production range where quantities of key-fitting, punch, die and tool sharpening are concerned.

Base is cast solid to avoid vibration and permit high speed. Convenient and rigid knee and table operated by hand wheel, holds work solidly in any desired position.



Table, 11 x 20 inches, has a vertical travel of 12 ins. on the guides and may also be equipped with a reversible sliding table. Floor space required, 28 x 20 inches. A very convenient all-around machine for general shop or tool room grinding.

Send for catalog of grinding and polishing machinery.

Valley City Machine Works
GRAND RAPIDS, MICH.

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EQUIPMENT C.

Adapted to all classes of grinding:

Cylindrical, Surface, Disc,

Internal and Cutter Grinding

of all descriptions. The machine is equipped with power automatic cross feeds for cylindrical and surface grinding. The one machine that can be truly classed as a complete universal.

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Another Unit has been added to our system of general supply warehouses and sales agencies with the opening of our extensive and well equipped warerooms in Toronto. At these headquarters we are handling full lines of

Machine Tools and Supplies

Mill and Contractors' Supplies. Everything for Power Transmission

INCLUDING A LARGE STOCK OF

Steel Pulleys, Hangers, Belting, etc.

AS WELL AS

Tools, Valves & Fittings, Bolts, Nuts, Washers, Set & Cap Screws, etc.

A few of the Firms whose Products we carry are:

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John Steptoe Shaper Co., Shapers.
Fay & Scott, Lathes.
London Machine Tool Co., Machine Tools.
Mueller Machine Tool Co., Radial Drills.
Standard Pressed Steel Co., Steel Hangers.
H. G. Barr, Sensitive Drills.
Cleveland Twist Drill Co.
South Bend Machine Tool Co., Lathes
Hisey-Wolf Machine Co., Electric Drills.
American Pulley Co., Pressed Steel Pulleys.
Beardmore Belting Co.
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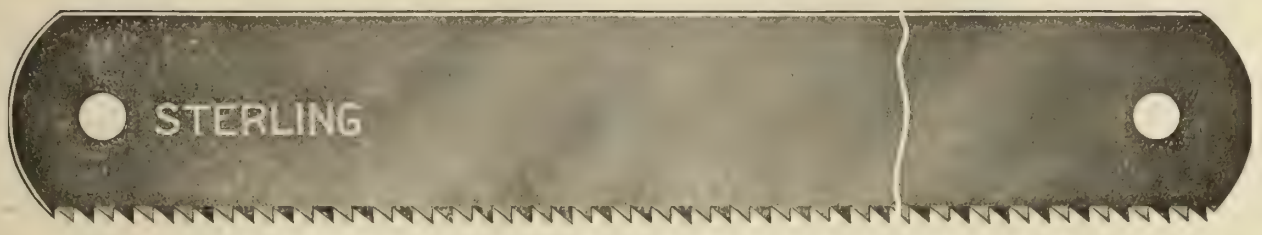
The General Supply Co. of Canada, Limited

OTTAWA TORONTO WINNIPEG

115-125 ADELAIDE STREET WEST

OUR SERVICE WILL PLEASE YOU

"Sterling" Hack Saws



"Sterling" Hack Saw Blades

have a world-wide reputation for their superiority. The best steel that can be procured is used in the manufacture and skilled workmanship of many years' experience enable us to offer the trade a strictly first-class blade.



No. 2½.

"Sterling" High Speed Power Saw

The No. 2½ Machine has been recently placed on the market, has automatic lift, adjustable vise and many other improvements. "Sterling" blades used in this machine will give excellent results, and prove an economical investment.

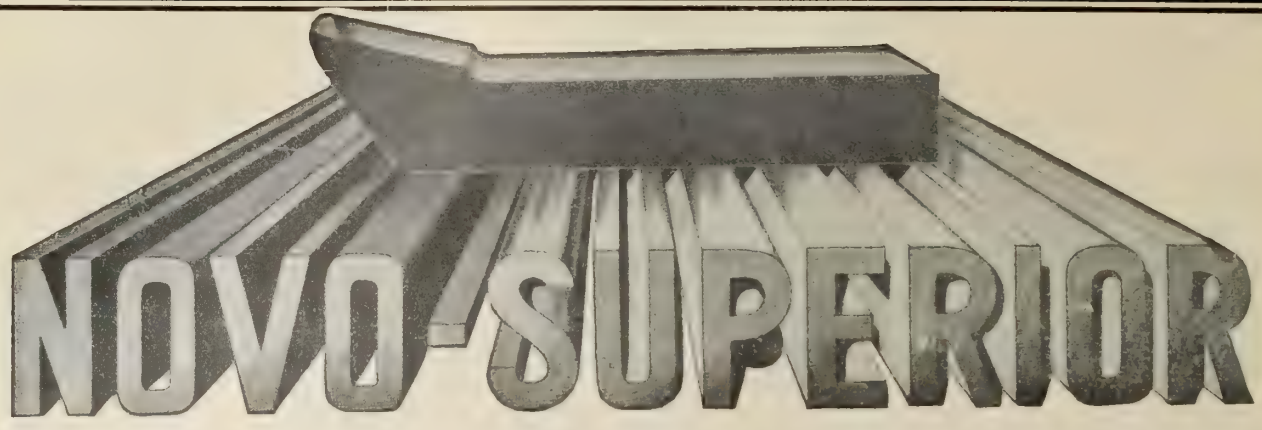


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Firth's EXTRA Tool Steel
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We carry in our Montreal warehouse a large stock of these well-known brands in Rounds, Squares, Octagons and Flats. Annealed and Un-annealed. All standard sizes in suitable tempers for all purposes.

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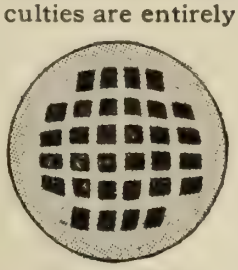
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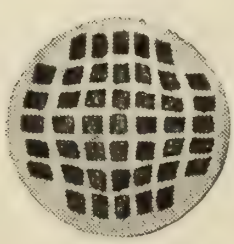
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Broken Screwed Studs for Cylinders and Boiler Mountings. **Piston Rods, Stay Bolts and Rivets** in Boilers and Steam Pipes. **Chains, Drawbars, Coupling Links, Hooks,** of Haulage Clips. **Axles, Locomotive Crank Pins, Etc.,** are a constant source of trouble and annoyance, but such difficulties are entirely overcome by using



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3 1/2 in.	2.70
4 in.	2.85
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4 3/4 in.	$4.35
5 in.	5.45
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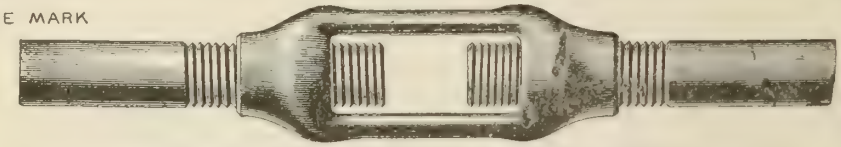
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They do not split and will outlast many dozens of the ordinary handles. Mechanics prefer them on account of the agreeable touch which makes work a pleasure. Their use is protection against sore hands and splinters. The price is lower than that of wood handles. Ask for discounts. If your dealer cannot supply you write us direct.

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B Drop Forged Turnbuckles

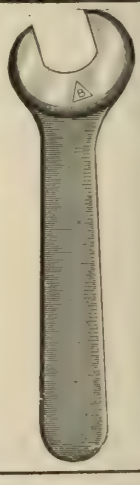
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Send Models of Blue Prints for Estimates.

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ARMSTRONG

DROP FORGED STEEL LATHE DOGS



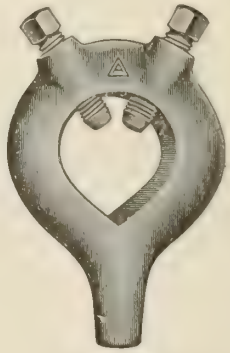
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All Sizes
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Uniformity of design.

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No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.



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Have Armstrong Quality

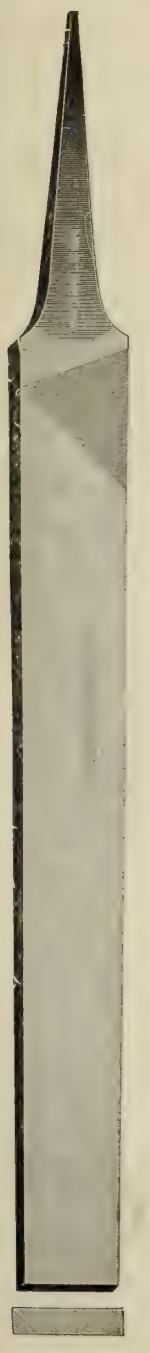
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MADE FILES



Mr. Manufacturer:—

No matter what grade of work you handle, we have a Nicholson-Made File that will meet your requirements, and give the best of satisfaction.

The Nicholson-Made File will reduce your cost of filing, because its standard quality and temper allows a deep cut and leaves a smooth finish on the article being filed.

Test it yourself—put it to comparison and watch the result.

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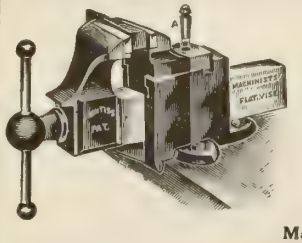
DOMINION WORKS - PORT HOPE, ONT.





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There is but one

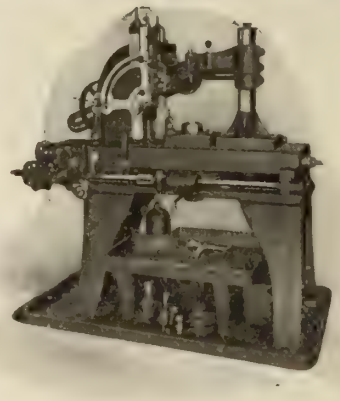
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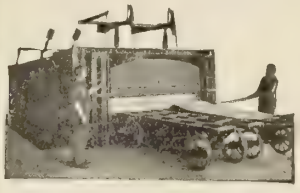
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AUTOMATIC
Gear Cutting
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No. 26

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Made in Canada.
Stock carried for **immediate shipment.**

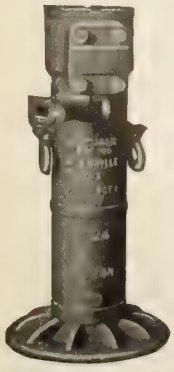


Manufactured only by

A. O. NORTON,
COATICOOK,
Prov. QUEBEC.

STOCK CARRIED BY
MUSSENS LIMITED, - Montreal and Winnipeg

H & E PATENT BALL BEARING LIFTING JACKS
for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.

Made in plain and foot lift styles, fully guaranteed.



Manufactured by

H & E Lifting Jack Company
WATERVILLE, QUE.

Stock carried by F. H. HOPKINS & CO.
Montreal

CUT GEARS
THEORETICALLY CORRECT
IN
RAWHIDE OR METAL

ROBERT GARDNER & SON LTD
Nazareth St. — MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.

Thor

PISTON AIR DRILLS



Sold in Canada by
H. W. PETRIE, Limited
Toronto
Montreal
Vancouver

The Drill with CORLISS VALVE MOTION
30% greater efficiency guaranteed.

Independent Pneumatic Tool Company
Chicago New York Pittsburg San Francisco

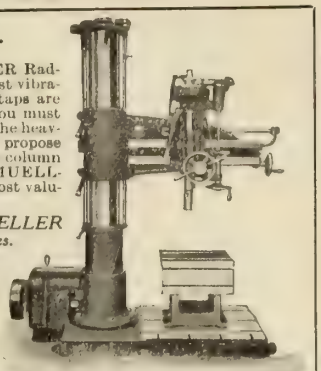
MUELLER RADIAL DRILLS.

MUELLER RADIAL DRILLS. MUELLER RADIAL DRILLS.

Mr. Drill User:—

The one-piece column of the MUELLER Radial Drill is a positive guarantee against vibration, and, since high speed drills and taps are daily coming into more general use, you must figure on a Radial Drill that will take the heaviest cuts without any vibration, if you propose to do accurate work. The one-piece column was patented by us and every user of MUELLER Radial Drills will tell you it is a most valuable feature.

Let us tell you more about the MUELLER Radial Drill and its many good features.



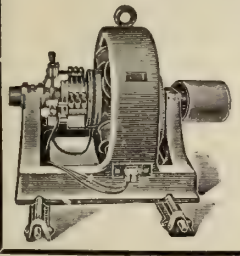
The Mueller Machine Tool Co.
Cincinnati, Ohio, U.S.A.

AGENTS:—The General Supply Co. of Canada, Ltd., Toronto, Winnipeg, Ottawa; Hallman & Peniston Machinery Co., Vancouver, B.C.; The Foss & Hill Machinery Co., Montreal, Que.

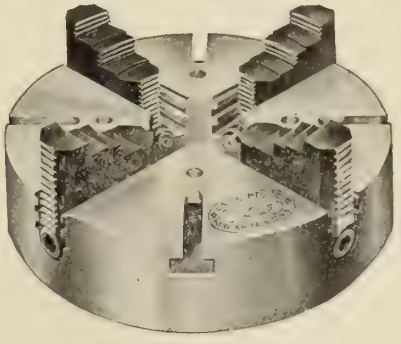
MUELLER RADIAL DRILLS.

YOU NEED MORE LIGHT
IN YOUR FACTORY. WRITE

TORONTO & HAMILTON ELECTRIC CO.



MANUFACTURERS OF
Dynamos
for Light and Power
AND ALL
ELECTRICAL APPARATUS



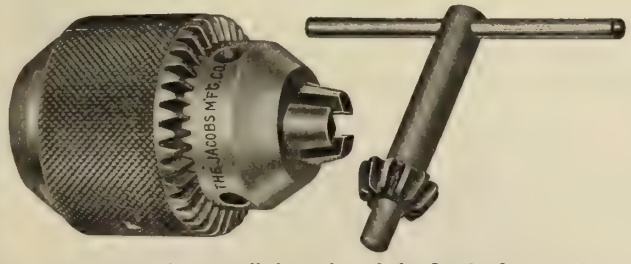
Remember:

That the Union Independent Chuck is different from any other made. It has the great advantages of double bearing ribs of the jaw in the shell; hardened steel bearings for the operating screw, making it a strong and substantial chuck

Union Manufacturing Co.

26 Cortlandt Street, New York NEW BRITAIN, Conn., U.S.A.
MAKERS OF A COMPLETE LINE OF CHUCKS

UNEQUALLED SERVICE DEMONSTRATED QUALITY



The seven years of unequalled service of the Jacobs Improved Drill Chuck, and the purchase of more than 3 330 during March and April, 1911, demonstrated the superior QUALITY of the Jacobs Improved Drill Chuck. Every part of this Chuck is fully guaranteed.

Our thirty-four page illustrated catalogue sent upon request.

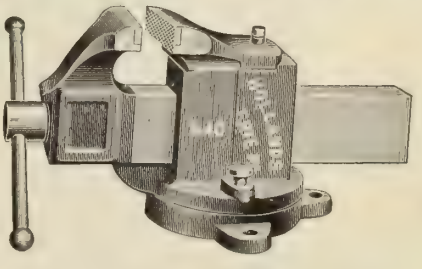
The Jacobs Manufacturing Company, - Hartford, Conn.

HOLLANDS VISES

have been used exclusively for a quarter of a century by many leading industrial and railway shops in Canada and U.S.A

Each style is adapted perfectly to its particular work.

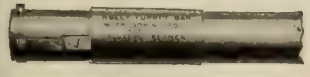
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Filers' Vise with Swivel Base and Jaw

Hollands Mfg. Co. - - Erie, Pa.

Type B.—Turret 1" to 5¼"



THE KELLY REAMER

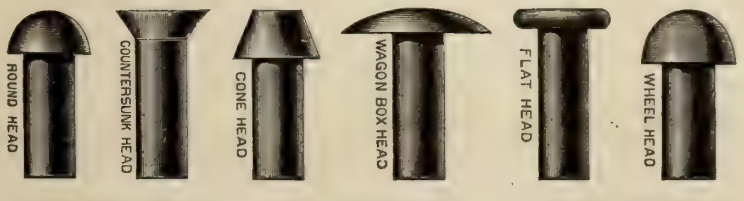
—HIGH SPEED—
ADJUSTABLE—REPLACEABLE—BLADES
We solve the "**HOLE**" problem—ask us.
THE KELLY REAMER CO., Cleveland, U.S.A.

Type C.—Cylinder, 3" to 12"



CHAS. NEAT & CO., Agts.
112 Queen Victoria St.
London, - England

NEW YORK OFFICE
96-98 Reade Street



We manufacture Rivets of every description, ½ inch dia. and smaller.

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

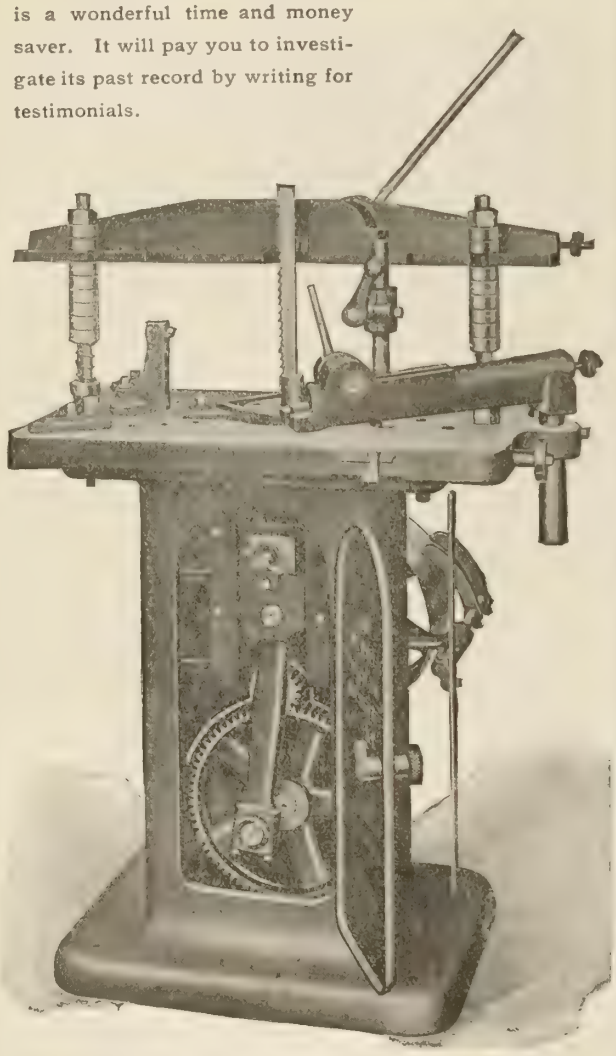
NO. 1 DAVIS KEY-SEATER

is intended for internal key-seating, and is furnished complete with heavy clamping bar for large work, and also a special clamping bar for small work.

We have spent many years experimenting and improving on this machine, and we now guarantee it to be mechanically perfect.

No. 1 Davis Key-Seater

is a wonderful time and money saver. It will pay you to investigate its past record by writing for testimonials.



Write for Catalog.

The W. P. Davis Machine Company

Office, Salesroom and Factory, Rochester, N.Y.



Protect Your Operatives From Injury By Machinery

The best accident insurance policies you can buy are safety appliances that protect your operatives from accidental contact with dangerous machinery. That's why so many manufacturers use

GREENING'S WIRE MACHINERY GUARDS

We make these guards to special order, but prices are exceedingly low nevertheless because of our great facilities and enormous output of wire goods. Remember, a few dollars spent on Greening's Wire Machinery Guards may easily mean the saving of thousands of dollars in damage actions, not to speak of the satisfaction that comes from a knowledge that adequate preventive measures have been adopted in your plant.

Write us for estimates on your requirements

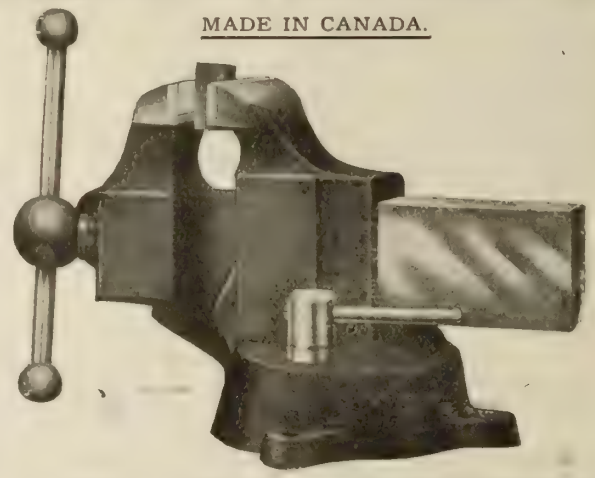
The B. Greening Wire Co., Ltd.

Hamilton, Ont. - - Montreal, Que.

The YOST

Solid Jaw and Swivel Bottom Machinist's Vise

MADE IN CANADA.



A vise with a grip like grim death; a durability that defies time and the hardest usage.

A vise that will give you a lifetime of perfect service and satisfaction. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

Incomparably Good

The National catalog would certainly interest you. Write us, asking for a copy.

National Machinery & Supply Co., Ltd.

HAMILTON - - ONTARIO

This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.

The advertiser would like to know where you saw his advertisement—tell him.

Phone Main 256

The Hall Engineering Works

14 TO 16 JURORS STREET, MONTREAL

Engineers and Machinists

Brass and Iron Founders
Boilermakers and Blacksmiths

Special Portable Boring Gear for Boring Engine Cylinders, Etc., In Place.

MACHINE TOOL
AND
DIE MAKERS

Russell Machine Co. St. Catharines, Ont.

First-class Workmanship

Prices Right

Estimates Furnished to the Trade



BLOUNT'S Wet Tool GRINDER

Ensures Machine Shop Economy

On this Grinder there is absolutely no wear of parts, as the propeller of the centrifugal pump, furnishing a constant supply of water, is loosely fitted, and does not touch the case at the nearest point.

The main bearings are long and self-oiling, and the machine can be run continuously if desired, to avoid loss of time in starting and stopping.

A sleeve cap prevents leakage without the use of packing.

J. G. BLOUNT COMPANY, Everett, Mass., U. S. A.



BUTTERFIELD'S Taps, Dies and Reamers

are a necessity to every skilled mechanic, as they have stood the test where others have failed.

This is due to the careful selection of materials, and the special hardening and tempering process through which they are put during their manufacture.

Our tools are sold only with iron-clad guarantee.

Write for 1911 catalog.

Butterfield & Co.

ROCK ISLAND, QUE. DERBY LINE, VERMONT

The "PARKER" Improved Quick-Action Swivel Vise

is made of a special blending of steel and best iron, which adds materially to the life of the tool.

It is efficient, quick-working and convenient.

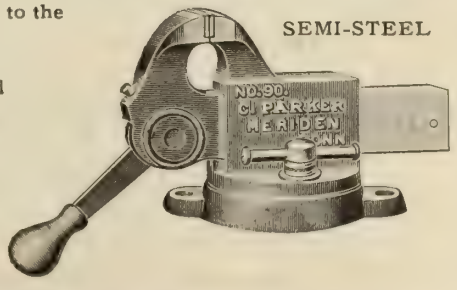
By one motion of either right or left hand any piece of work can be grasped with certainty.

Only high-grade workmen are employed in the manufacture of this vise, and all parts are interchangeable.

Write for our New Illustrated Catalog

The Charles Parker Co., Meriden, Conn., U.S.A.

SEMI-STEEL

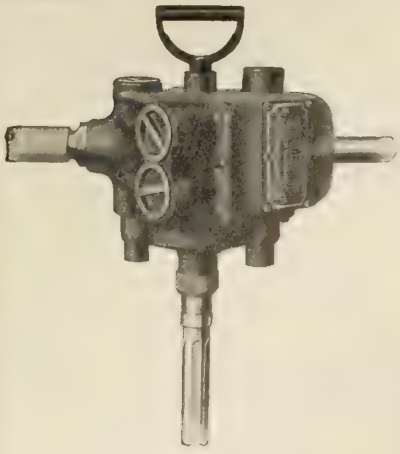


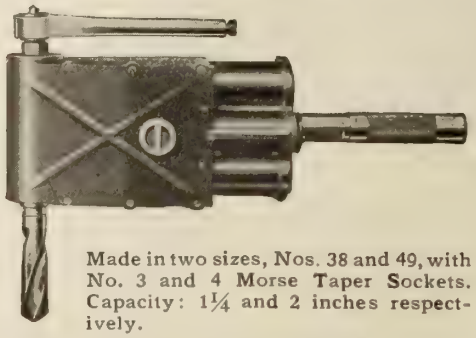
Don't fail to mention "Canadian Machinery" in writing to advertisers.

Cleveland AIR TOOLS

Cleveland Corner Drill

FOR CLOSE QUARTER DRILLING





Made in two sizes, Nos. 38 and 49, with No. 3 and 4 Morse Taper Sockets. Capacity: 1¼ and 2 inches respectively.

¶ Adapted to Drilling and Reaming in narrow places where the Center Spindle Drill cannot be used.

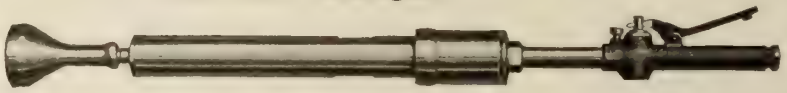
¶ Can drill or ream within 1⅛ inches of side wall or corner.



Riveting Hammers and Chipping Hammers are made in sizes to suit all classes of work and are fitted with either outside or inside latch as preferred.

Cleveland Four-Piston Air Drills are made in sizes to suit all classes of work and furnished reversible or non-reversible as required.

Write for Illustrated Catalogue "L"



DUST PROOF

Cleveland Sand Rammers for Floor, Flask and Bench Ramming. Made in sizes adapted to general Foundry and Steel Castings Work

The Cleveland Pneumatic Tool Co.

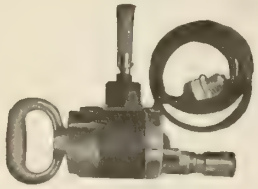
NEW YORK General Offices and Works, Cleveland, Ohio, U.S.A. CHICAGO

A. R. Williams Machinery Co., TORONTO, WINNIPEG, VANCOUVER and ST. JOHN'S

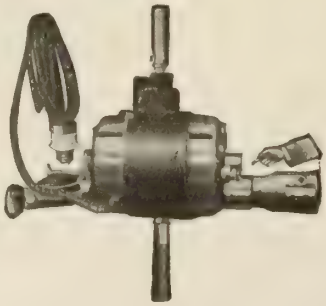
Williams and Wilson, MONTREAL

U. S. Electric Drills and Grinders

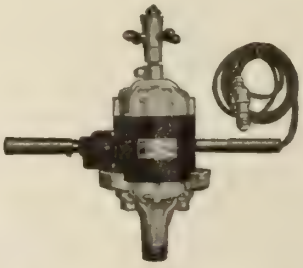
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



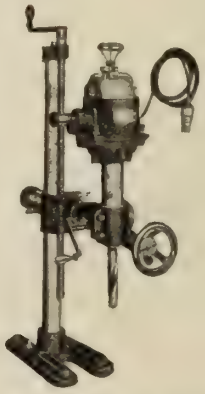
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

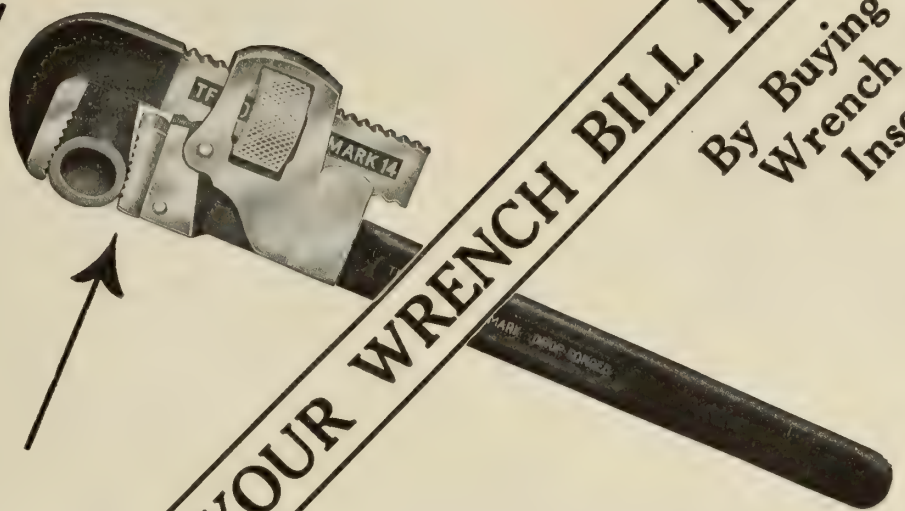
For sale by THE CANADIAN FAIRBANKS CO., LTD.

Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - OHIO, U.S.A.

USE
The Trimo
Pipe Wrench



AND CUT YOUR WRENCH BILL IN TWO

By Buying the Pipe Wrench with the Inserted Jaw In the Handle

Send for Catalog No. 200

Made by The
Trimont Mfg. Company
55-71 Amory St - Roxbury, Mass



"CROWN"
SAND RAMMERS

The absolute safety, simplicity and economy of transmitting compressed air make it admirably adapted to driving portable tools, and are factors which have done much to place the pneumatic tool equipment well up on the list of dividend-earning machines.

The application of these pneumatic labor-saving devices to industrial problems has probably reduced labor costs more than any one invention since that of the steam engine.

The "Crown" Sand Rammer is one of the latest pneumatic appliances to be added to the foundry list, and is one of those very essential elements of the modern equipped foundry.

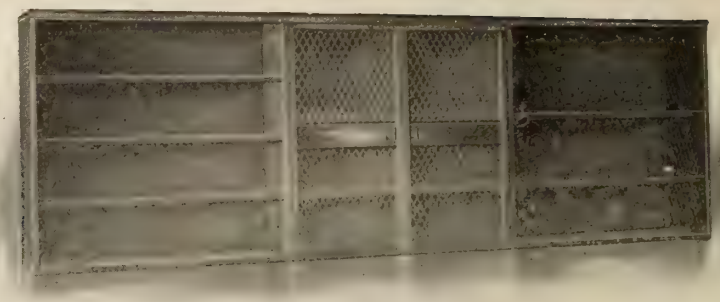
Records of ramming and peining time from representative foundries all over the country show that a man with the "Crown" Rammer will prepare a flask in 15 to 25 per cent. of the time taken by hand, and the mould is more uniform, and a better casting is assured.

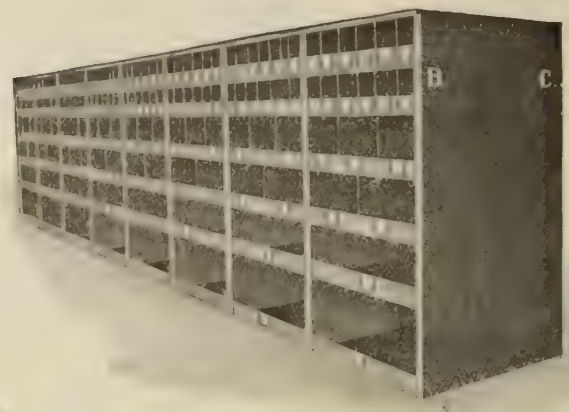
They are light, of convenient length, operate freely and consume but very little air.

Made for Bench and Floor Work. *Descriptive Pamphlet 8108*

CANADIAN RAND CO., LIMITED
Commercial Union Bldg., MONTREAL, CAN.
TORONTO COBALT WINNIPEG LETHBRIDGE ROSSLAND SPOKANE VANCOUVER SYDNEY







"D.L." Standard METAL LOCKERS and Shelving





Economize Space and Save Money

The "D. L." Standard Metal Lockers have specially well-made doors and locking device, and each locker bears a distinctive number with corresponding key.

They are absolutely fire-proof, will prevent petty thefts, economize space, save contents, reduce your insurance rates and promote order and system.

Besides this, they are sanitary and protect your workmen from contagion.

The "D. L." Steel Shelving is built on the unit system —Sections can be added as requirements expand. It is easily assembled, is adjustable and adapted to many uses. It possesses great strength and stability, is fire-proof and economizes much space. All shelves are provided with label holders.

Write for Catalogue on these Money-Savers

Dennis Wire & Iron Works Co., Limited

LONDON, - - CANADA

Toronto Office, 12 Queen Street East

The advertiser would like to know where you saw his advertisement—tell him.



Has Your Factory Plenty of Light and Fresh Air?

That these are *absolute necessities* in modern factory and office buildings no man who has a shred of progressiveness in his make-up can argue.

Poor daylight and insufficient ventilation mean tired employees, short days, big lighting bills and decreased output.

Yet the ordinary wood sash for factory buildings, if of sufficient size, is so heavy and clumsy in structure that it is not only very *expensive* but *obstructs a large part of the lighting area*, and the difficulty of opening it, particularly in cold or damp weather, prevents proper ventilation.

"Fenestra" Solid Steel Sash

is a light, strong steel frame and sash combined, admitting from 25 to 40 per cent. more light through an opening than wood sash.

Not only does it increase the effective lighting area by occupying less space itself, but, because of its almost unlimited resistance to wind-pressure, windows may be built of it in almost any size.

"Fenestra" Sash encourages your employees to properly ventilate their work-rooms by making it easy and handy to open and close the ventilators. "Fenestra" ventilators do not swell in damp weather nor freeze up in winter. Replace the foul air and the smoke and gas-laden atmosphere in your factory with fresh air, give your employees plenty of daylight and watch the effect on your output and lighting expenses.

Bear in mind, also, that "Fenestra" Sash are *fireproof* and materially lower insurance rates.

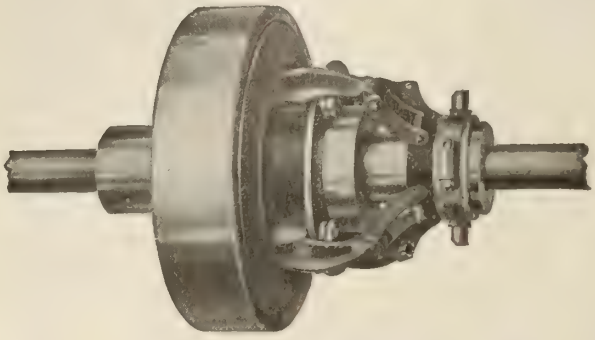
They are made in any size or shape, and are always built to supply individual needs.

If you are planning or erecting an industrial building of any kind that you intend to make permanent let us send you our "Fenestra" catalogue. A post card brings it to your desk. Address "Steel Sash Branch."

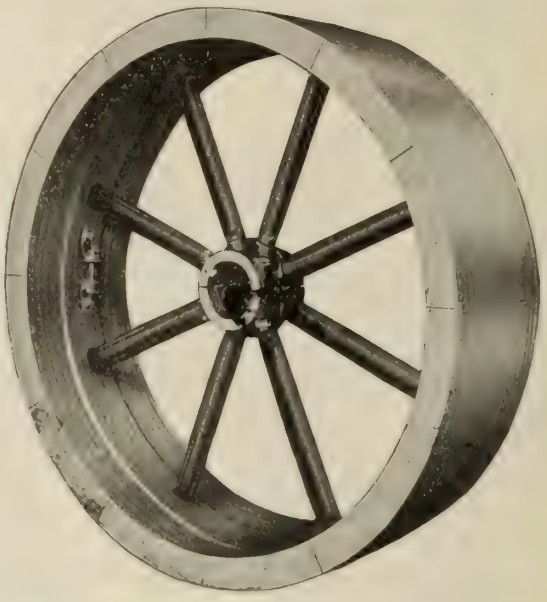
STEEL AND RADIATION, LIMITED

TORONTO: Fraser Avenue **MONTREAL: 138 Craig Street West**

The POSITIVE Line



Combined Jaw and Friction Clutch



Combination Split Wood Rim Steel Center Pulley

A Talk on Clutches

While the present commercial types of friction clutch possess the necessary flexibility, yet the difficulties and extravagance in the consumption of power, arising from wear and slipping of the friction blocks with continued use in driving the load, has placed them in the class of low-efficiency mechanisms. This undesirable factor offered an opportunity for needed improvement in clutch design.

In the **POSITIVE** Combined Jaw and Friction Clutch the low-efficiency feature has been overcome and both a durable and dependable appliance perfected. The frictions are used only to pick up the load and bring the speed of the driven shaft up to that of the driving shaft; then the jaws lock and transmit the power, the frictions releasing. Thus, the **POSITIVE** Clutch embodies the flexibility of any clutch, but it is different in that it is a positive drive—no slipping—a 100 per cent. efficiency appliance.

Can you afford to run your plant without the clutch that users tell us every day has a most remarkable feature—the Positive Steel Jaws—that cannot slip, the clutch that **does** save power.

Want our new catalogue, "The **POSITIVE** Line?"

A Talk on Pulleys

There are pulleys and pulleys, and pulleys. Some are heavy and give a stolid serviceableness like an old hob-nailed boot; but they are in no wise efficient, nor modern. Others are light; and while they do show greater efficiency, this factor has been accomplished by sacrificing strength and durability in construction. Then, again, there are others that are in a measure light and strong, yet have a low-rim belt contact. It was up to somebody to build a durable, and at the same time, efficient pulley.

The **POSITIVE** Combination Split Wood Rim Steel Center Pulley satisfies every advantageous exaction. The wood rim is waterproofed and gives high belt contact; the steel arms, inserted into the rims with steel pins and forced into the hubs under enormous pressure and upset, assure low wind resistance and great strength; the malleable hubs with the cast iron bushings grip the shaft like a vise. It is split, easily installed, light, durable, and highly efficient.

Just consider whether you ought not to have in your shops the modern pulley, the efficient pulley, the pulley that has the good points of them all—and none of the bad ones—the pulley that **does** save power?

Want our new catalogue, "The **POSITIVE** Line?"

The Positive Clutch & Pulley Works, Limited

TORONTO, - - ONT.

Eastern Representatives and Warehouse: CANADA FORD CO., Limited, MONTREAL, P.Q.
American Works: BUFFALO, N Y.

The advertiser would like to know where you saw his advertisement—tell him.

GOODYEAR

Power-Saving Rubber Belting

Goodyear Rubber Belting stands for power saved and money saved. It is built up of plies of rubberized fabric cured and vulcanized into one solid piece. It neither slips nor stretches. It has the cohesiveness of rubber with the enormous tensile strength of close woven, long fibre cotton fabric from which ***all stretch has been taken out.***

Goodyear Rubber Belting is manufactured by a process that makes it proof against steam, water, weather and rot. Made in all three grades and all sizes. For Pulp, Paper, Saw Mills—***all*** mills where horse power transmitted is large and demand for tensile strength great. Used by biggest lumber mills and manufacturing plants in the Dominion. ***Outlives, outlasts*** all other belts.

Rot-Proof Mill Fire Hose

Goodyear Underwriters is a hose built to meet the specifications of the Associated Factory Mutual Fire Insurance Companies. Tube used of highest grade NEW rubber. ***Won't*** harden or crack with age. Special circular woven fabric with least expansion or elongation under pressure. Antiseptically-treated to make it rot and mildew proof.

The strongest, most reliable hose for all mills and factories. Insist on ***Goodyear Underwriters, the hose with the black and yellow stripes.***

Non-Chipping Conveyor Belts

Built for all purposes. For conveying crushed stone, grain, coal, ore, etc.

Made in all thicknesses of face to suit requirements of buyer. Rubber face made of toughest stock possible, to prevent cutting and chipping. Gives longest, most enduring service.

We also manufacture other rubber goods such as tires, all kinds of hose and belting, rubber packing, etc.

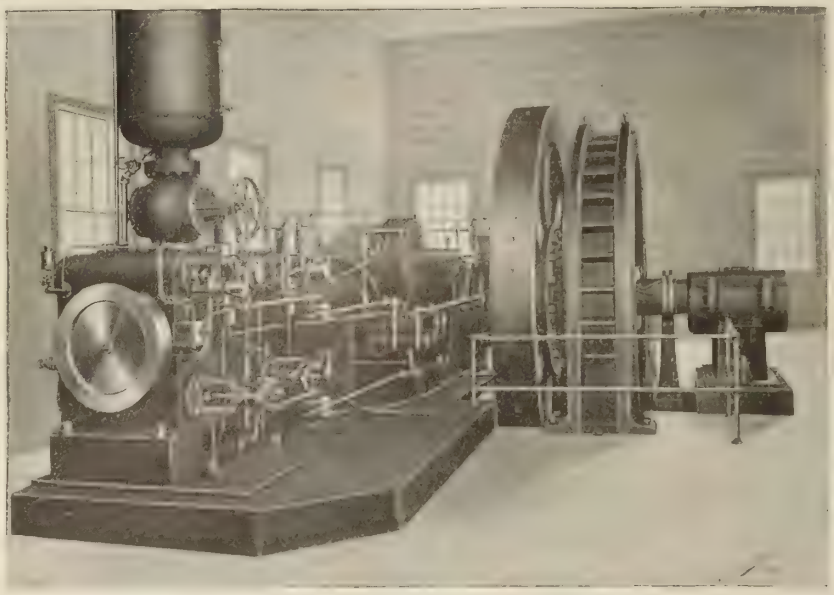
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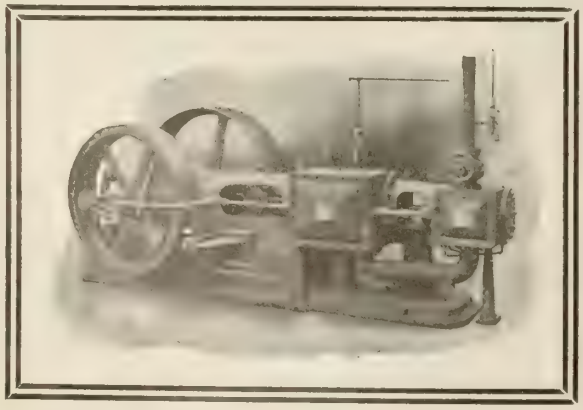
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Gentlemen:— San Francisco, Cal., Jan. 27th, 1911.

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I remain Yours truly,
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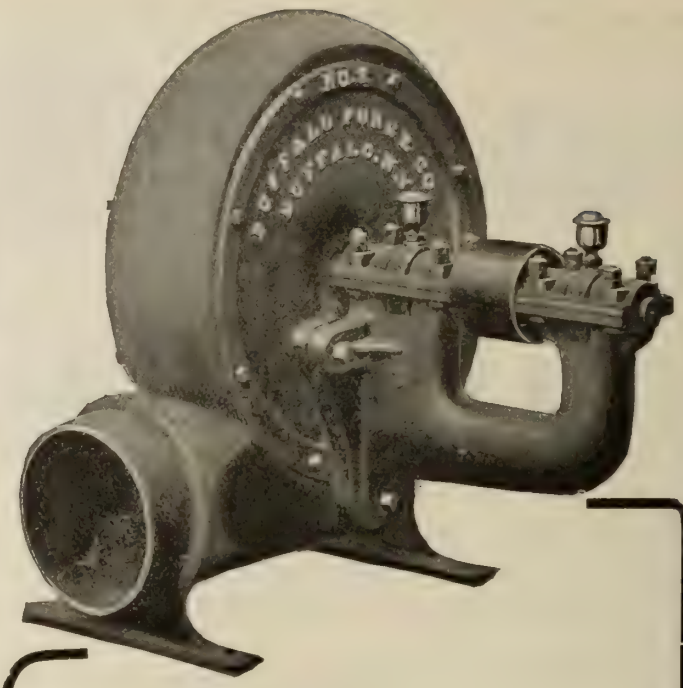
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Mr. Robert A. Ross, E.E., of Ross & Holgate, Consulting and Supervising Engineers, Montreal, writes:

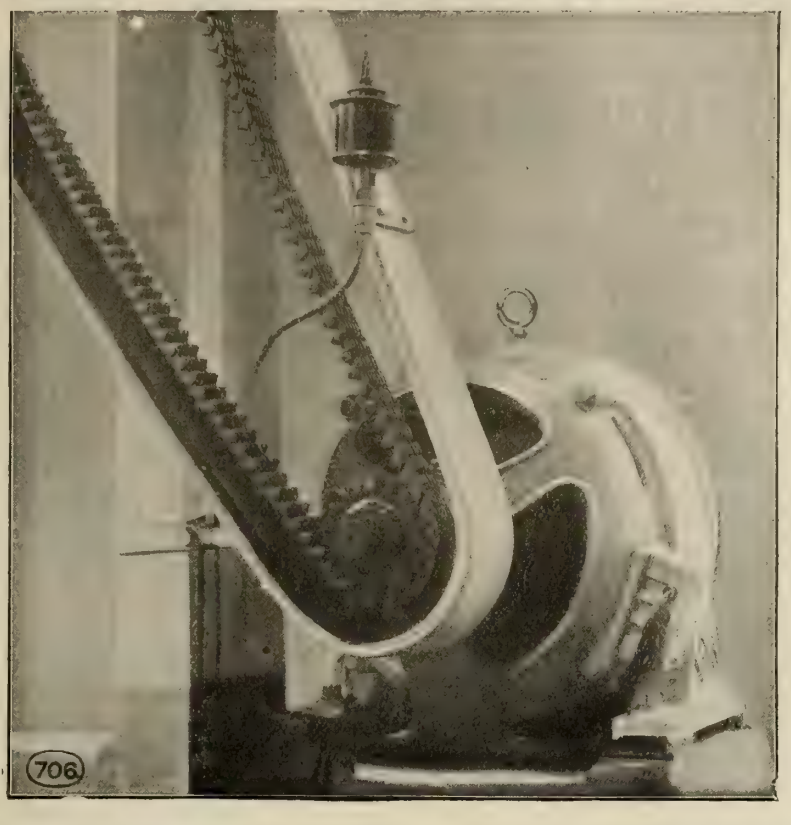
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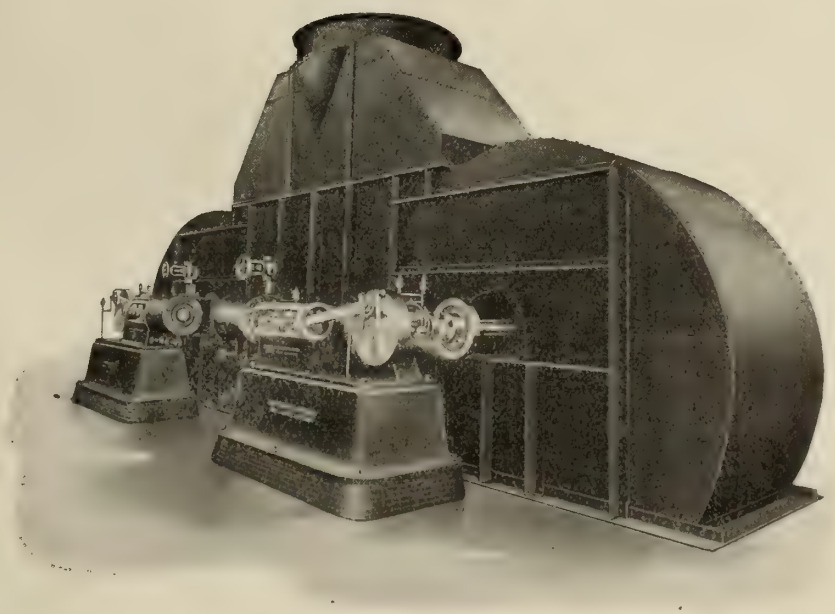
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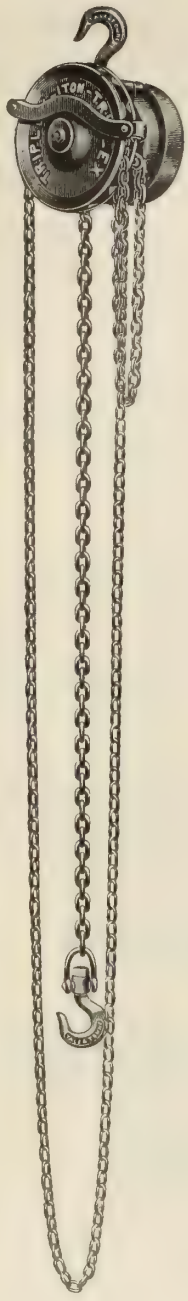
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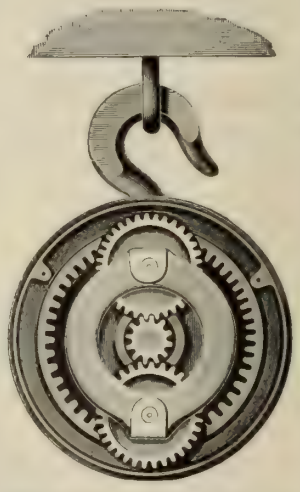
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The Montreal Technical School, Its Mission and Equipment

By L. G. Dennison, B.A., B.Sc., Montreal

The Rapid Growth and Development in Canada of Mechanical and Electrical Engineering Pursuits, and the Desire to Excel in These Competitively With Other and Older Countries, has Called Forth the Necessity for Facilities and Opportunities, By Which the Practical Work of the Factory may be Turned to Better Account Through a Judicious Admixture of Technical Training. Technical Schools are in Project by all the Leading Manufacturing Centres of our Country, and That of Montreal Which Forms the Subject of this Article, is Among the First of its Kind to be Completed and Open for the Reception of Students.

THE lack of an efficient technical training institution has been keenly felt for some considerable time in Montreal, and while efforts have been put forth on various occasions to deal satisfactorily and successfully with the question, only recently did these assume that definite shape, the culmination of which has been the building and equipment of a Technical School, costing approximately $825,000.00, and creditable to Canada's Metropolitan City.

Foundation and Buildings.

Founded, built, equipped and annually subsidised by the Provincial Government of Quebec, and in receipt of a large yearly grant from the City of Montreal, this school is intended to provide adequate and complete instruction in manual trades generally, from the theoretical and technical standpoint, at moderate fees, to day and evening students. Its location is 70 Sherbrooke Street West, and the birds-eye view, fig. 1, gives a good idea of the lay-out and ground covered. The buildings are arranged in two distinct sections: the main structure being on Sherbrooke Street, and the workshop in the rear. The ground measurement is 153,000 square feet.

Main Building and Organization.

The main building which is wholly fireproof, comprises the following. The offices of the Adminstration, several suites used for teaching, including six class rooms, two amphitheatres with seating capacity of 100 each; physical and mechanical laboratory, chemical laboratory, store rooms for materials, museum of industries, library, etc. In the centre there is a large graded semi-circular amphitheatre with seating capacity for 600.

The different sections of the main building offer ideal conditions from the standpoint of comfort and hygiene. The class rooms are large, and equipped to secure complete satisfaction with respect to light, ventilation and heating. A commodious waiting room, toilet rooms, shower baths, and appropriate furniture throughout, conspire to impress one that expense and effort has not been spared to provide a thoroughly up-to-date establishment for its particular purpose. It is proposed to aug-

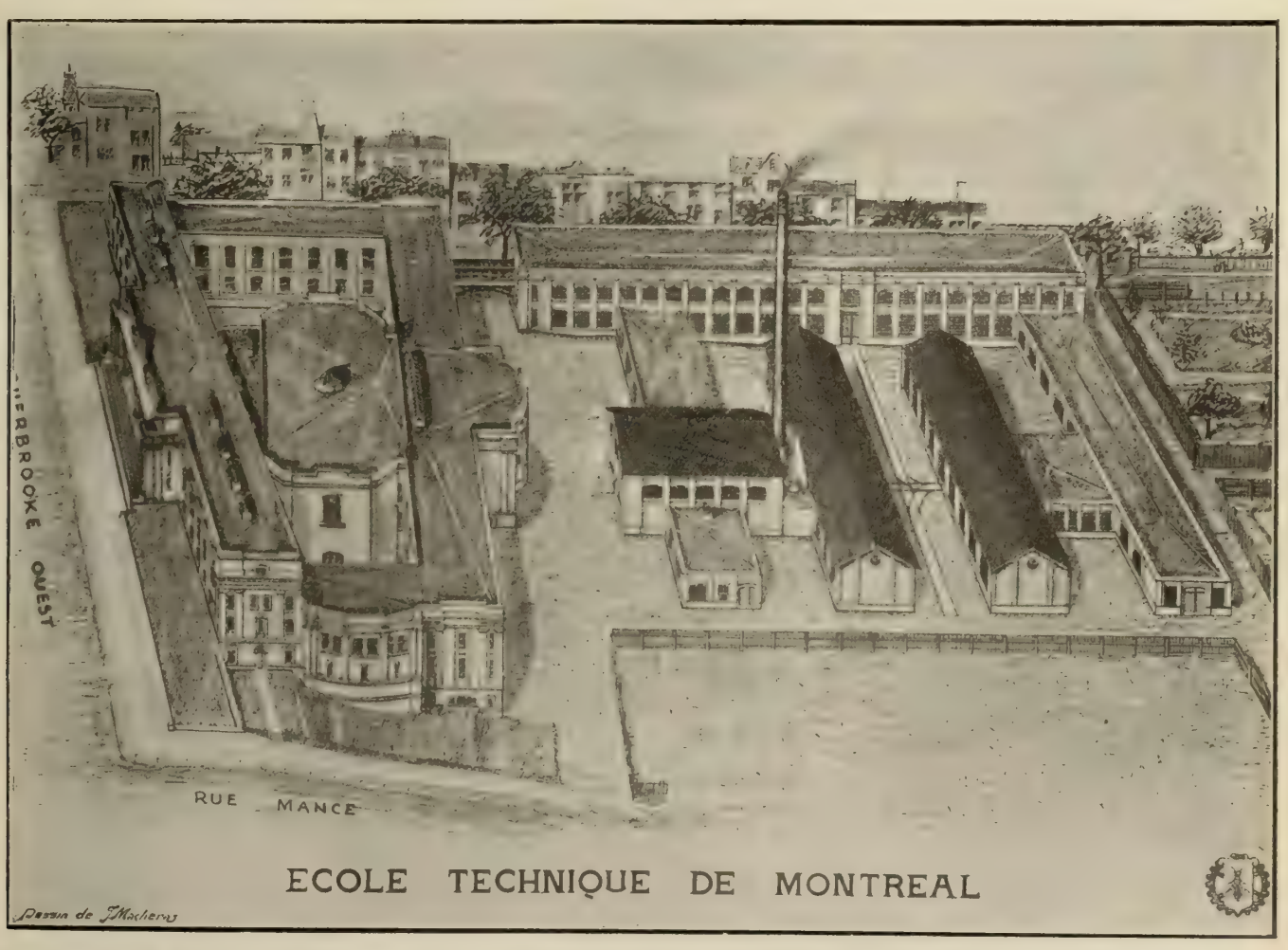
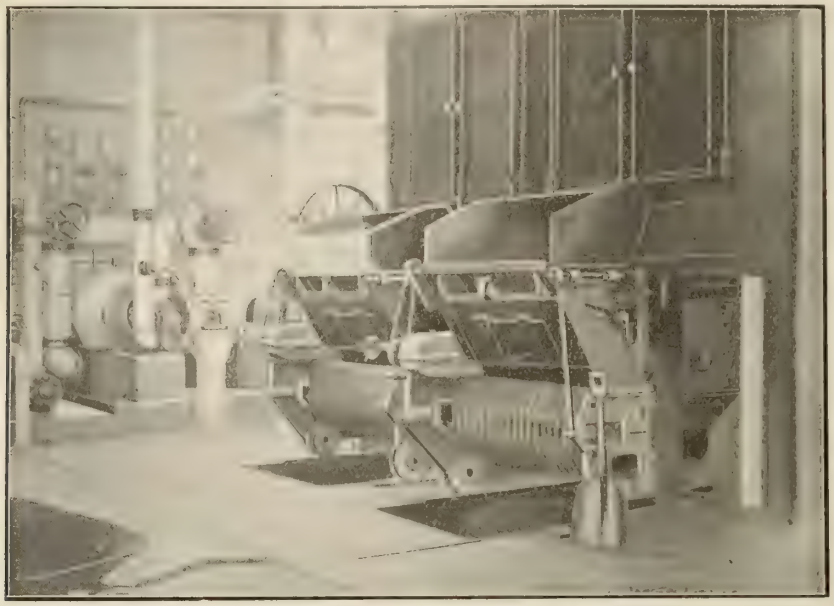


FIG. 1.—BIRDS-EYE VIEW, MONTREAL TECHNICAL SCHOOL.

ment the equipment and teaching apparatus by directing the work of the students accordingly, during each school course. Instruction will be given in both languages, French and English.

Work Shops and Power Plant.

The workshops are laid out on similar lines to those of modern industrial concerns; in the centre is the power house, and around are the foundry, machine shop, smith shop and electrical laboratory.



The Power House—Montreal Technical School.

The boiler room equipment consists of two Babcock and Wilcox boilers and one Delaunay-Belleville marine type boiler. The B. &. W. boilers have chain grates, operated by a Miller Bros. & Toms engine. The heating apparatus for all the buildings is installed in the boiler room.

In the engine room are installed four electrical groups with direct connection, as follows:

1—One of 25 K.W., consisting of a gas motor Duplex, with Canadian General Electric dynamo;

2—One of 35 K.W., consisting of a Robb-Armstrong horizontal steam engine, with Canadian Crocker-Wheeler dynamo;

3—One compound vertical Bellis-Morcom engine, connected to a 75 K.W. Westinghouse dynamo;

4—One Goldie-McCullough Corliss engine, connected to a 125 K.W. Allis-Chalmers-Bullock dynamo.

An air compressor for the foundry, a storage battery with capacity of 200 ampere-hours, and switchboard for the control of the light and power, also form part of the engine room equipment.

The Switchboard.

In keeping with the high quality and finish of the various units, is the switchboard fig. 2, built and designed by the Hill Electric Switch & Manufacturing Company, Montreal. It consists of two feeders, one accumulator, and three generator panels of polished white Italian marble, which furnish a most attractive background for the highly finished copper fittings. The feeder panel, from which radiate the various power circuits, contains a Bristol watt-hour meter for recording total station output, and three double pole plain overload Condit circuit breakers. The lighting feeders are controlled by knife switches, with enclosed fuses on the face of the board. The accumulator panel has besides the meters, an underload breaker, a battery rheostat, and an eleven point end cell switch. The generator panels are equipped with Weston flush-type ammeters, of range 150 per cent. of generator output; and have three pole knife switches with fuses on the rear of the board. The voltmeter, fig. 3 on a swinging arm at the extreme left, can be made to indicate either the bus bar voltage, the voltage of any machine, or the drop of potential between bus bars and ground. The marble slabs, 7 feet high and two inches thick, rest on the floor thirty inches from the wall.

Machine Shop.

The machine shop has an area of 11,340 square feet, and contains the following machines, grouped in three sections, each driven by a 15 H.P. motor. Ten plain lathes of 10 inches, twelve screw cutting lathes of different makes from 12 inches to 18 inches, one Pratt & Whitney tool-room lathe; one geared-head Hendey lathe; three screw machines, one of which is automatic; four shapers, two planers; one seven-inch slotting machine; eleven drills from ten to twenty inches; one Brown &

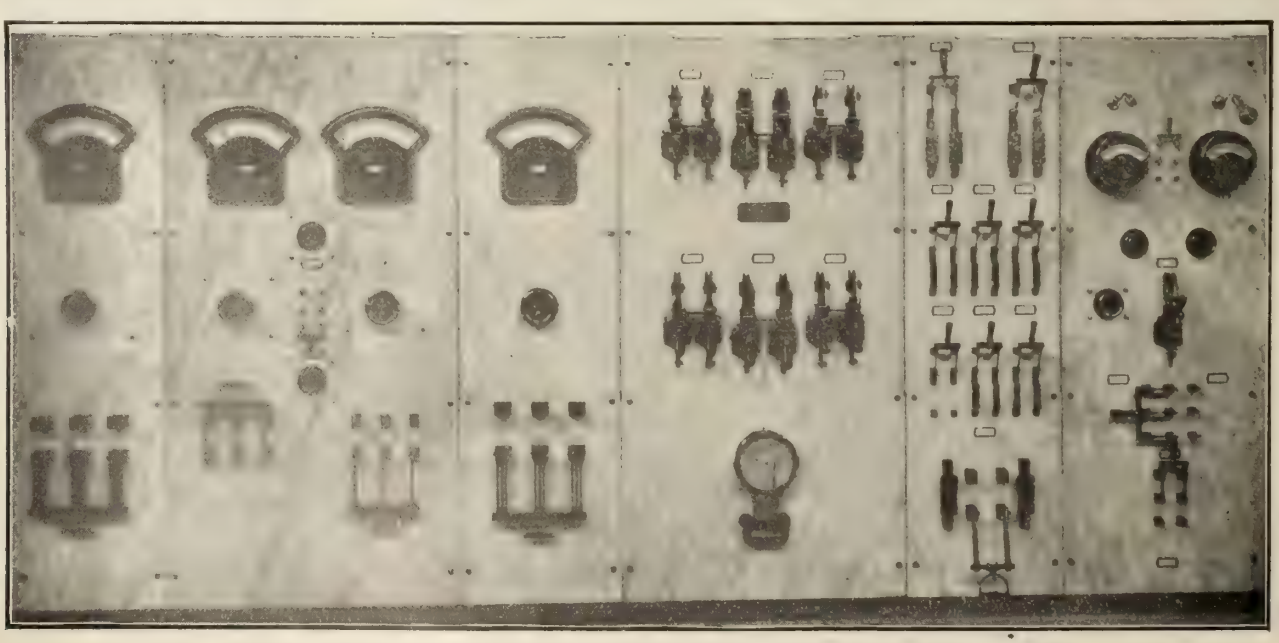
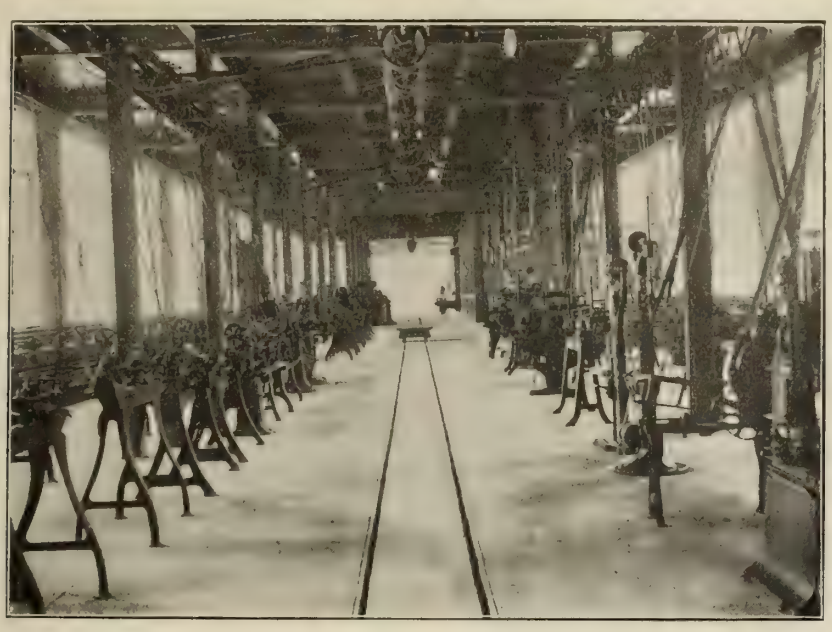


Fig. 2—Switchboard by the Hill Electric Switch Co., at the Montreal Technical School.

Sharpe universal milling machine ; one plane and one vertical milling machine; one profile milling machine ; one pentagraph milling machine ; one universal grinding machine ; one gear cutter ; five tool grinders ; one buffer ; two centering machines ; two mandril presses and a two ton portable crane.



The Machine Shop—Montreal Technical School.

In addition to the above, there are the following large machines, each driven by its own electric motor ; six screw cutting lathes with attachments, one thirty-inch vertical lathe, one chucking lathe, one three foot radial drill, one horizontal boring mill and one floor planer. The space reserved for erecting is served by a three ton traveling crane. The tool store contains a full line of hand tools, measuring and tracing instruments, such as usually used in the best shops, also two Stewart combination gas furnaces..

Eighty vises, and 160 sets of individual tools complete the installation.

Forge.

The forge has an area of 5,210 square feet, and comprises twenty-four Sturtevant forges, twenty-four anvils, and one Buffalo Heating Furnace. The draft is underground and is produced by a 9 H.P. electric fan, while a 4 H.P. electric motor provides the necessary blast.

The other equipment consists of a steam hammer of 170 pounds, one belt driven hammer of 75 pounds, an emery tool grinder, a bar shear, a post drill, two swedge blocks, two blacksmith vises and one tool bench and vise.

Foundry.

The foundry has an area of 5,210 square feet, and is provided with one King cupola of two tons capacity per hour, one oil melting furnace, a Piat combined cupola and a 200 pound crucible furnace. This section is served by a trolley of two tons capacity. An underground installation of compressed air provides for the working of the elevator and other pneumatic tools and machines.

Other foundry equipment consists of two molding presses, one core machine, one coning machine, two core ovens, one sand sifter, one sand mill, one sand mixer, two snagging wheels, one torch heater and molder's benches for twenty-four pupils.

Wood-Working Shop.

The area of the woodworking shop is 6,811 square feet, and the machinery includes eight power wood lathes, four electric driven lathes of variable speed, one electric band saw, one circular saw, one gig saw, one buzz planer, one pony planer, one mortising machine, one tenoning machine, one drill, one shaper, two grindstones, one trimmer, one automatic band saw filing and setting machine, one knife grinder and one band saw brazer. There are thirty benches, with two separate sets of small tools each.

Electrical Section.

The electrical shop, covering an area of 2,714 square feet, adjoins the machine shop, thereby allowing use to be made of the latter as required. The following machines are installed :

One armature banding and heading machine, one notching press, one shear, one pair of smoothing rolls and one buffer.

Annexed is an electro-dynamics laboratory, containing the following five groups of rotary transformers :

1—One single-phase asynchrone motor coupled to a direct current dynamo.

2—One direct current motor coupled to a three phase generator.

3—One series dynamo with shunt dynamo.

4—One six-change commutator.

5—One direct current motor coupled to an alternator giving single-phase, two-phase, or three-phase current, as desired, and the switchboard already described, which provides for electrical connections and measurements, as desired for experimental purposes.

Heating and Ventilating Systems.

The system of heating adopted, is that known as "Forced Hot Water Circulation," and is designed to be operated in connection with a high pressure power plant, utilizing exhaust steam from engines, pumps, and other apparatus. The heating medium, hot water, is circulated from the power house through the different buildings, by steam driven turbine pumps. The installation comprises two large heating tanks, one for exhaust, and the other for live steam ; so arranged that when the amount of



The Blacksmith Shop—Montreal Technical School.

exhaust steam available for heating is insufficient to maintain the desired temperature in the buildings, an automatic valve opens, and allows the water of circulation to pass through the live steam heater before being forced through the buildings.

The particular features of this arrangement, consist in utilizing every



The Foundry -Montreal Technical School.

pound of exhaust steam before live steam is requisitioned, and the consequent absence of back pressure on the engines. During many weeks of operation under severe conditions last winter, the temperature of water returning to the power house was less than ten degrees below the out-going temperature, and several occasions dropped only two degrees.

The buildings are ventilated by means of large ventilating fans and steam tempering coils, the temperature of the whole being regulated by the Powers System of Automatic Temperature Control. Thirty cubic feet of fresh air per minute per pupil is supplied and exhausted in all class rooms, and liberal ventilation given in the work shops. Another interesting feature of the mechanical equipment, is the vacuum cleaning outfit provided for all portions of the main Academic Building.

The heating, ventilating, vacuum cleaning, and major portion of the electrical installation were designed and supervised by Huey & Bellanger, consulting engineers, since incorporated under the name of the Canadian Domestic Engineering Company, Limited, 5 Beaver Hall Square, Montreal.

The material and cuts for this article, were furnished by the courtesy of the school management, the consulting engineers and the different contractors.

SPUR GEARS.

By G. D. Mills, Montreal.

THE immediately preceding example, in our August issue, determines the load on the wheels from a known velocity and required horsepower. Many machines are, however, subjected to shock loads which double the stress on the teeth, and produce a load largely in excess of that which the horsepower and velocity indicates. Further, wheels which are to be run at differet speeds should be designed for the speed which produces the largest load. The preceding method has been used more particularly to show how the Lewis Formula for horsepower can be used to determine the load on the teeth, and if the load is known, the teeth can be designed accordingly.

Horse Power of Electric Motors.

The horsepower of electric motors is measured similarly; the load being determined by means of a device known as a Prony Brake, which consists of two curved blocks clamped on the motor pulley and provided with thumb screws to regulate the pressure. The lower block is extended with an evenly balanced wood arm of convenient length, in the end of which is fastened a lag screw. The point of the screw pressing on the platform of a scale, registers the load in pounds transmitted from the motor by means of its torque or twisting stress, and the amount of torque equals the number of pounds registered on the scale, multiplied by the length of the lever arm in feet from the centre of pulley to the centre of lag screw. The electrical formula reads, H.P.=

$$\frac{2 \times 3.1416 \times T \times S}{33{,}000}$$

, in which T = torque, and S = revolutions per minute. In measuring the load by this method, we have increased the diameter of the motor pulley to twice the length of the lever arm, or the lever arm is the radius of the circle through which the load is measured, and 3.1416 is multiplied by 2 for this reason. The Lewis and electrical formulae are therefore identically

GEARS AND PULLEYS.

$$D : d :: r : R$$

D = pitch diameter of driver = $\frac{d\,r}{R}$

d = " " " driven = $\frac{D\,R}{r}$

R = revolutions per minute of driver = $\frac{d\,r}{D}$

r = " " " driven = $\frac{D\,R}{d}$

$$N : n :: r : R$$

N = number of teeth in driver = $\frac{n\,r}{R}$

n = " " " driven = $\frac{N\,R}{r}$

R = revolutions per minute of driver = $\frac{n\,r}{N}$

r = " " " driven = $\frac{N\,R}{n}$

the same, although presented in somewhat different form. The electrical formula may be made to read H.P.= 2 × 3.1416 × radius in feet × registered load in lbs. × revs. per min. ÷ 33,000, and the Lewis formula H.P.= 3.1416 × diameter in feet × rev. per minute × load ÷ 33,000.

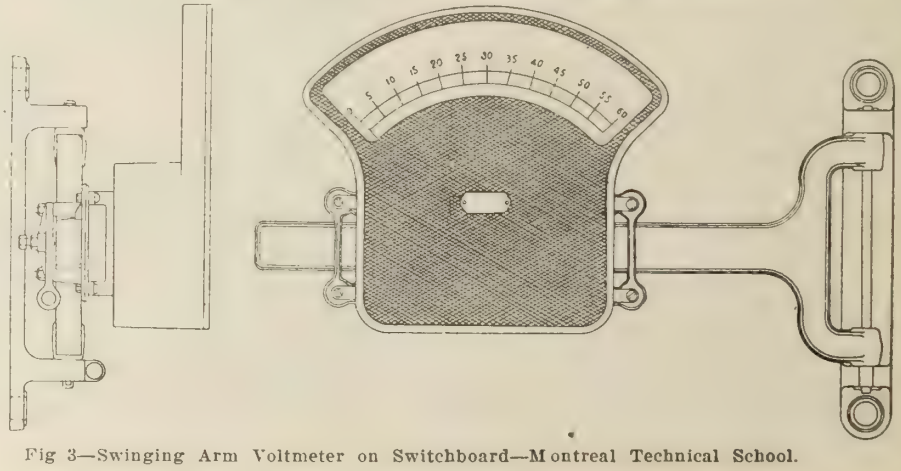


Fig 3—Swinging Arm Voltmeter on Switchboard—Montreal Technical School.

Pitch Diameter and Number of Teeth.

The pitch diameters or number of teeth may also be determined from the foregoing equations. These are derived in each case from the diameters or teeth and speeds. The proportions by which the pitch diameters are calculated, serve equally well for pulleys, when the diameter of pulley is substituted.

Wheels, which work together continually in one direction, must necessarily wear on one side of the teeth. In order to equalize this wear, due provision should be made to reverse the wheels on their respective shafts. This operation will not be called for, however, if they are reversed by the action of the driving mechanism.

Templets.

An essential feature, in the manufacture of spur gears, is a templet of tooth profiles, by which the cutting and finishing operation may be brought to some degree of accuracy. While templets of only a few teeth are advocated, a full templet of the entire number in a wheel, which can be traced on sheet zinc and cut out, is the only perfect guide by which the inaccuracies of cutting and finishing may be remedied. This is perhaps, a tedious and expensive plan, where only one or a few wheels are required, but when numbers of gears of the same size are to be made, it is the correct thing to do. A wheel, which is perfectly cut and finished, will wear evenly on each tooth, while a gear which is defective, is obliged to wear more on the teeth which are incorrectly formed or defective in spacing. It is therefore safe to say, that if a wheel wears excessively on a few teeth, there are sure to exist defects of some kind in those teeth. One rotary gear cutter can only be perfect for one number of teeth of its diametral pitch, and its profile should be formed with due provision for the finish of that number of teeth. As tooth faces which have been formed by a rotary cutter are utterly unfit for use unless they are filed or otherwise finished, rotary cutters usually have a range of several numbers of teeth whose profiles closely resemble it, and the cutter will cut them equally correct, if a templet is provided while while the teeth are being finished. The finish of the engaging faces of gear teeth is quite as important as the finish of a shaft bearing. Well finished teeth add to the life and efficiency of a well cut wheel, although gears are often made defective in finishing, by reason of the fact that no templet of the teeth is provided.

Tooth Profiles.

Spur gear teeth, in common use, are divided in two classes, and known as double curve and single curve, or cycloidal and involute teeth. The cycloidal or double curve tooth is composed of two curves. The upper curve, or that part of the profile which projects from the pitch circle, is known as part of an epicycloid, and is obtained by the geometrical operation of rolling a generating circle on the outer circumference of the pitch circle. The lower curve is known as part of a hypocycloid, and is obtained by rolling a generating circle in an opposite direction on the inner circumference of the pitch circle. The operation necessary to produce one perfect profile, however, is not by any means unimportant and has led to the adoption of an approximate method, extensively used, and closely resembling the true profile in normal wheels.

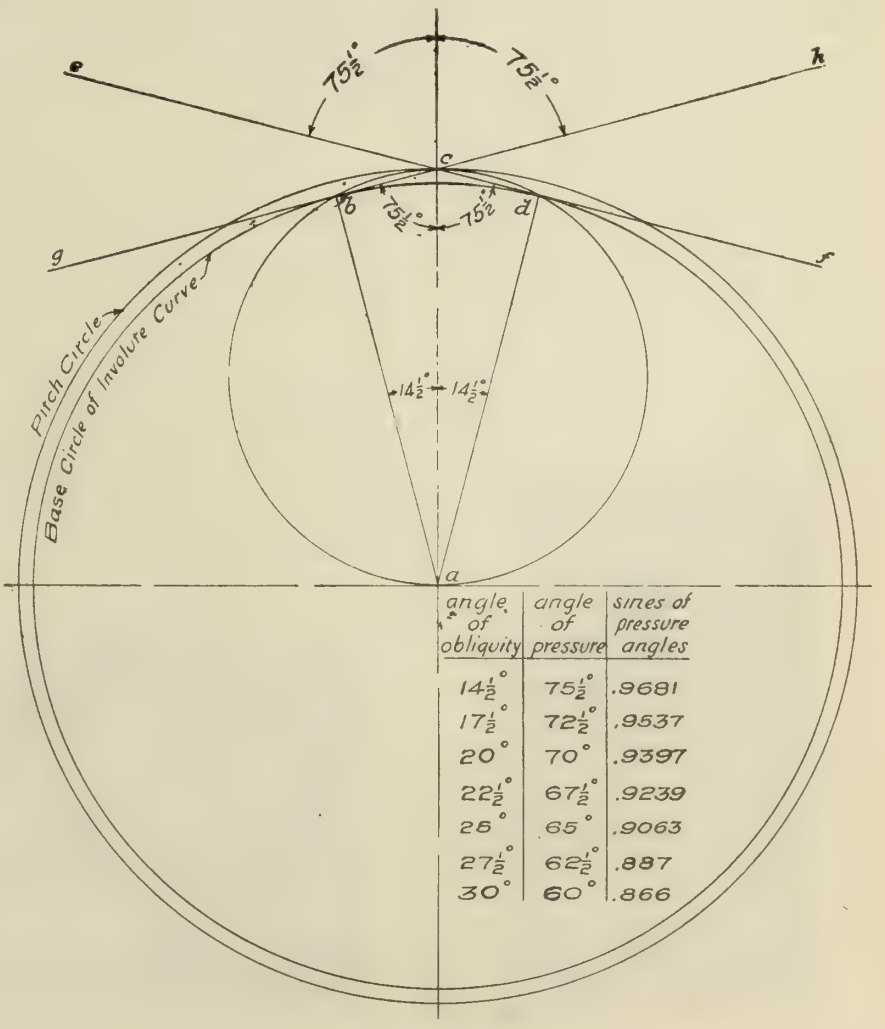
The Involute Curve.

The involute curve is obtained by unwinding a string from a cylinder. Involute or single curve teeth are more generally used than cycloidal teeth. The base of the single curve extends below the pitch circle, while the remaining portion of flank, between the fillet at the bottom of tooth and the base circle, radiates with the centre of the wheel.

Fig. 3 contains a diagram by which the diameter of the base circle of the involute curve may be determined graphically, and also calculated. Involute teeth are more commonly distinguished by their angle of obliquity ; this being the oblique angle which the curve assumes with respect to a line through the centre of the wheel, and through the commencing point of the curve. The angle of pressure is at right angles to the angle of obliquity hence the angle of pressure equals 90 degrees minus the angle of obliquity. In Fig. 3 the angle of obliquity is 14½ degrees, being the angle in common use for ordinary wheels. The pressure angle 75½ degrees is defined by the lines e-c-f- and g-c-h, which are each 75½ degrees with the perpendicular line a-c. A circle, tangent to these two lines, is the base circle of the involute curve. One line is usually sufficient, however, in drawing the wheel.

Calculation of Base Circle Diameter.

In order to calculate the diameter of the base circle, we shall apply principles of trigonometry. It will be noticed that a circle has been described on the radius of the pitch circle which intersects the line e-c-f at "d". A line at right an-



angle of obliquity	angle of pressure	sines of pressure angles
14½°	75½°	.9681
17½°	72½°	.9537
20°	70°	.9397
22½°	67½°	.9239
25°	65°	.9063
27½°	62½°	.887
30°	60°	.866

Fig. 3 — Spur Gears.

gles to e-c-f from the centre "a" terminates at "d," which point is also the point of tangency of the base circle, as well as the intersecting point of the semi-circle; therefore the triangle a-d-c is a right angled triangle, since we cannot draw any other in a semi-circle with lines from the extremities of its diameter, to a point on its semi-circumference. This is well defined in the 3rd book of Euclid, proposition 31. The angle at "c" is equal to the opposite angle of pressure 75½ degrees, as defined in the 1st book of Euclid, proposition 15, and the angle at "a" is its complement, or the angle of obliquity 14½ degrees.

The hypotenuse of the triangle a-d-c, is the radius of the pitch circle a-c-, and the radius of the base circle of involute curve is the line a-d, therefore the radius of the pitch circle a-c, multiplied by the sine of pressure angle, or divided by the secant of the angle of obliquity, equals the radius of the base circle a-d. The diameter of the base circle can also be determined in a like manner, multiplying the diameter of the pitch circle by the sine of the pressure angle, or dividing it by the secant of the angle of obliquity. From the preceding, it will be noted, that with every change made in the angle of pressure, a corresponding change effects the triangle in the semi-circle; viz.: the angle at "a" is always the angle of obliquity and its complement is the angle of pressure. In the lower part of Fig. 3 will be found the sines of the pressure angles in general use and with which we may readily determine either the radius or diameter of the base circle of the involute curve without the aid of a protractor.

Applicability of the Chain Drive to Power Transmission

By C. T. R.

The Writer Points Out the Particular Circumstances Which Led to the Introduction of Chain Driving for Power Transmission Purposes, the Conditions Under Which It is Not Possible to Make Use of the System, and Details the Special Features Which Have Contributed to Highly Satisfactory Results in Numerous Installations.

NOW, that electricity is being so largely utilized by manufacturers and power-users in Canada, it is necessary to consider carefully the question of methods of transmission, because of the fact that this governs to a lesser or greater extent, the difference between the cost per horse power charged by the Power Co., and the cost per useful or productive horse power at the machine. Hitherto, the steam, gas or oil engine has provided a margin of power generally sufficient to cover losses in transmission without showing any increase on the power bill; but as power companies charge for the current taken by the motor and not the actual horse power at the machine, then, unless the transmission is efficient and the frictional losses low, hundreds of dollars may be paid each year for something which is not available for production purposes.

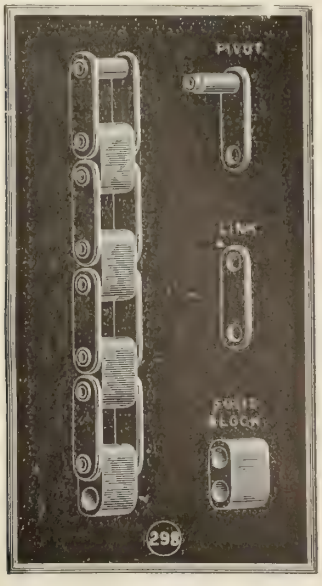


Fig. 3 — Solid Steel Block Chain Used for a Variety of Purposes.

Chain Drive Limitations.

There are many locations and conditions, particularly suited for belts, ropes and gears, and these systems will never be discarded; yet as the system of power transmission by chain has become more widely known, its advantages have been quickly appreciated and its popularity greatly increased among prominent Canadian firms. Chain driving of course has its limitations; for instance where power has to be transmitted at right angles, or where the driving and driven shafts run in opposite directions. This latter instance in itself debars its use on fully half the machine tools in service, and where otherwise it would be applicable. Chains are not affected by moisture, heat or oil; belts and ropes tend to slip under such conditions, with resultant loss of power accompanied by destructive heat. It was, however, in cases where shafts were too far apart for gears and too near for belts or ropes that chains made their debut. Their success in these fields, suggested trials in others.

Some Types of Chain for Power Transmission.

Fig. 1 represents the patent liner silent chain for speeds up to 1,300 ft., and having special provision for lubrication at still higher speeds.

Fig. 3 represents the bush roller chain for speeds ranging from 400 to 900 ft. per minute.

Fig. 4 represents the solid steel block chain for speeds up to 400 ft. per minute.

In each type, the links of the chain are blanked from steel strips of high tensile strength, and the bearing surfaces are of case-hardened steel. Briefly put the patent silent chain is suitable for practically all classes of high speed drive, the roller chain for heavy moderate speed drives as for automobile transmission, and the steel block chain to the variety purposes for which the malleable link chains have hitherto been used. In the present article, attention is directed only to the patent liner silent chain, on



Fig. 1a.

account of its being especially suitable for use in conjunction with electric motors. Figs. 4, 5, 6, 7, 8 and 9 show typical applications. The advantages claimed for the patent liner silent chain are briefly as follows :

Efficiency.

The efficiency is high, and moreover, is constant throughout its life. The principle of the chain is that of tooth gearing, and all possibility of slip is eliminated. Journal friction, i.e., loss of power, is a minimum, as the chain can be run practically slack on the wheels. With belts, considerable tension is frequently necessary, and particularly so with the small pulleys of high speed electric motors.

Durability.

This is largely governed by the conditions of each particular drive. We understand that there were drives installed in Canada 5 years ago, and still in service, which originally replaced other forms of transmission that could not stand the severity of the load and continuous service. These drives have been running regularly night and day, and apart from receiving lubrication, have not given any trouble. Other drives have been in regular service upwards of seven years, and with improvements in design and manufacture since then, even better results may be expected. Chains wear of course, after continuous service, but for the reason that they automatically rise on the wheel teeth as the pitch increases, the efficiency keeps constant.

Quiet Running.

In many instances, the gear makes no greater sound than a medium sized belt. It is impossible to have metallic pieces moving with absolute silence, and its degree is affected by the speed of the chain and the number of teeth in the sprockets. Noise is only produced when the chain speed is excessive, and when the number of teeth becomes very low.

Design.

The success of a chain drive is of course essentially a function of the design and material of construction. In a well designed gear, the action of the chain entering the wheel is purely a rolling one, see Fig. Ia, and except on wheels with exceptionally few teeth, sliding and hammering may be practically eliminated. The strength of a chain depends more upon the bearing area (see fig. 1) of the studs connecting the links, than any other feature, and this should be ample with the load distributed. The material of the wheels should be influenced by the ratio of the speeds between the driver and driven shafts, and should be such that the wear on each wheel is the same. The life is considerably shortened if the wear on the wheels is not proportional.

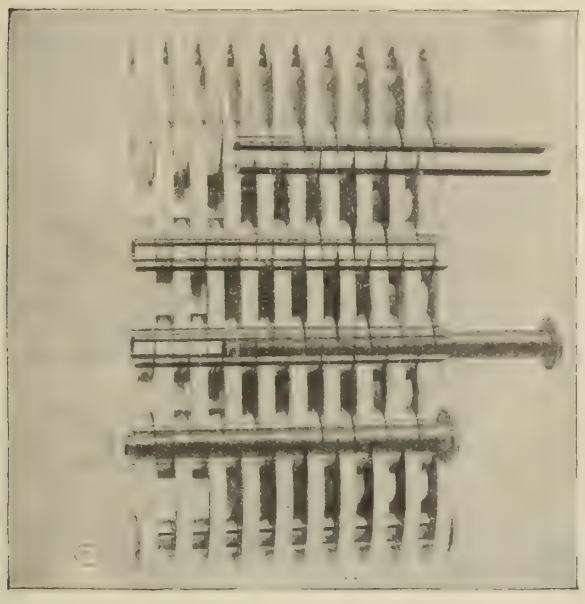


Fig. 1—Hans Renold Patent Liner Silent Chain.

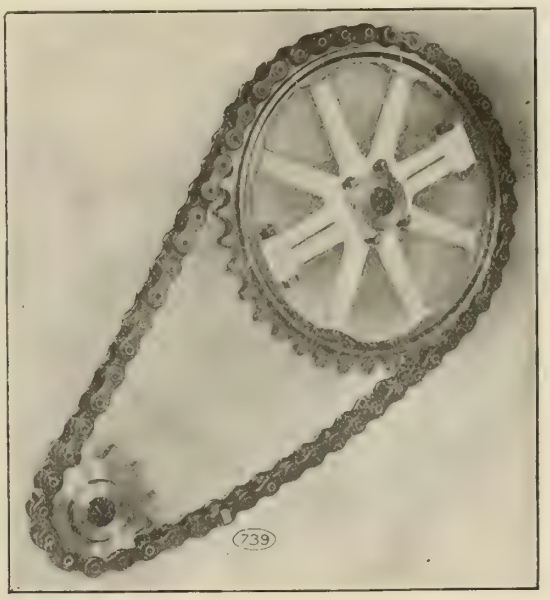


Fig. 2—Bush Roller Chain Drive for Heavy Loads and Moderate Speed.

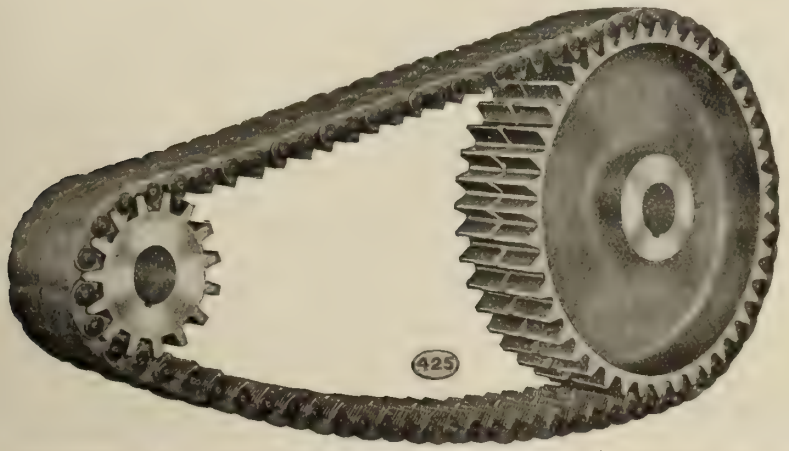


Fig. 4—A Typical 65 H.P. Silent Chain Drive. Wheels 15 and 65 T. Diameters, 7.5" x 31.25". Chain, 1.5" Pitch, 6" wide. Shaft centres, 5 feet.

Compactness.

This is probably one of the most important advantages chain transmission offers over belts or ropes, and it secures admission for the system into an unlimited field of application. The chain sprockets are approximately one half the size of belt pulleys of the same capacity, and they may be placed quite close together, thus economizing in space, and often providing a more convenient and satisfactory arrangement of machines. Again, the width of the chain is usually about one third the width of a belt for the same power.

To many, the first cost of a chain drive is an obstruction ; this being about 50 per cent. for small powers, and as

low as 35 per cent. for large powers, higher than a belt drive of equal capacity. It should be borne in mind, however, that higher efficiency, saving in power and increased production, mean more satisfactory transmission, at low cost. There are several hundred chain drives in use in Canada, a large majority of which are transmitting upwards of 200 h.p., with centres as short as six feet. Undoubtedly, as the system becomes more widely known and its advantages realized in actual service, adaptation will become much more general.

For the illustrations shown in this article we are indebted to Jones & Glassco, Montreal, the Canadian Agents for Hans Renold, Ltd., Manufacturers of chain driving gear, of Manchester, England.

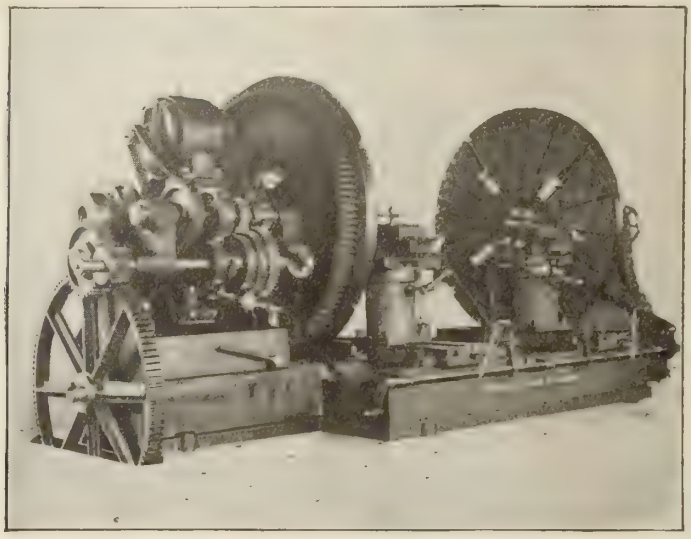


Fig. 7 — Lathe Drive from Motor by Silent Chain.

TO PREVENT STRIKES IN BRITAIN

The Labor Disputes Bill, which has been prepared by Will Crooks, M.P., and has received the approval of all political parties, proposes that wherever a dispute exists between an employer and any of his employes (numbering ten or more), and the parties are unable to adjust it, either of them may apply to the Board of Trade for the appointment of a board of conciliation and agreement to which the dispute may be referred.

Conciliation Board and Its Powers.

Each board is to consist of three members, one selected by either party, and the third (who is to act as chairman) on the recommendations of the members so chosen. "In every case where a dispute is duly referred to a board, it shall be the duty of the board to endeavor to bring about a settlement," and to this end it is empowered not only to make expeditious inquiry into all the matters at issue, but to put witnesses on oath and to call for the production of all necessary books, papers, and documents, as well as to enter at any time any building, mine, or factory included in its inquiry, and conduct any inquisition or interrogation it pleases. These ample powers come into operation whenever a board is appointed.

It is to be enacted that "it shall be unlawful for any employer to declare or to cause a lock-out, or for any employe to go out on strike, on account of any dispute, prior to or during a reference of such dispute to a board of conciliation and investigation under the provisions of this Act."

Lock-out and Strike Penalties.

Delinquent employes are to be liable to a fine of not less than $10, and not more than $50 per day. For employers who illegally declare a lock-out the penalty may be the minimum of $50 or the maximum of $1,000 per day. Those who incite either employers or employed to a breach of the law will be liable to a fine of not less than $50 and not more than $1,000. The parties do not regain their liberty to strike or lock-out until the subject in dispute has been dealt with—and not even then, it would appear, if they have bound themselves in writing to accept the settlement that the board may recommend; for in such circumstances the recommendation is to become legally enforceable.

APPRENTICESHIP AND THE UNEMPLOYED.

Much help is being given in solving the problem of the unemployed in England, by the National Institute of Apprenticeship. The majority of the unemployed are out of work because they are unskilled laborers, and the great number of unskilled is largely due to the diminution of apprenticeships. This Institution was founded six years ago "in order that boys and girls should start life not only with a liberal education and training given in the schools, but also with a practical training which was to be had in the workshop." Since it began work a large number of boys have been trained, and applicants

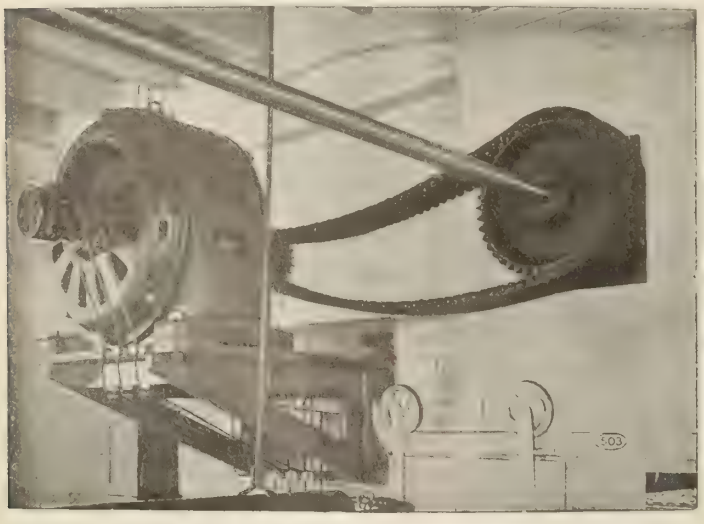


Fig. 5 — Typical Silent Chain Drive from Motor to Lineshafi.

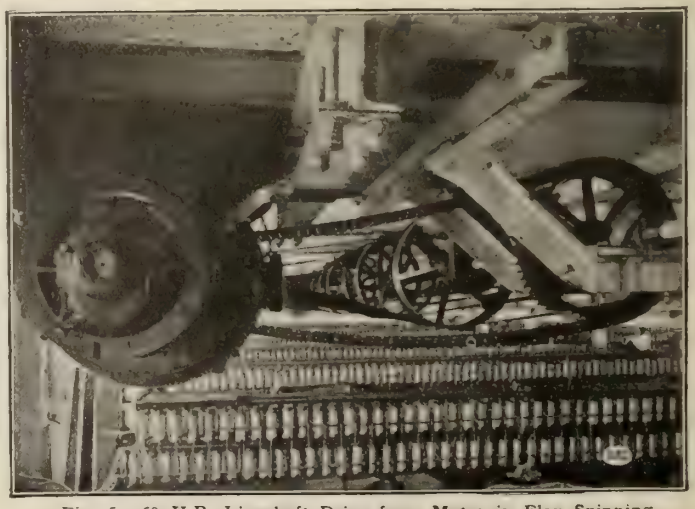


Fig. 6 — 60 H.P. Lineshaft Drive from Motor in Flax Spinning Mill, by Silent Chain.

for places now exceed forty a week.

On the registers of the institution there are the names of nearly 300 carefully selected masters, many of them ranking among the most important in their respective trades, who have taken or agreed to take apprentices for the institution. The only qualification required for an applicant is his, or her, respectability and fitness for the selected trade. No other questions are asked, and no other restrictions imposed. The institute supervises the apprenticeship so as to ensure, as far as possible, that the apprentices are properly taught their trades and do their duty to their masters.

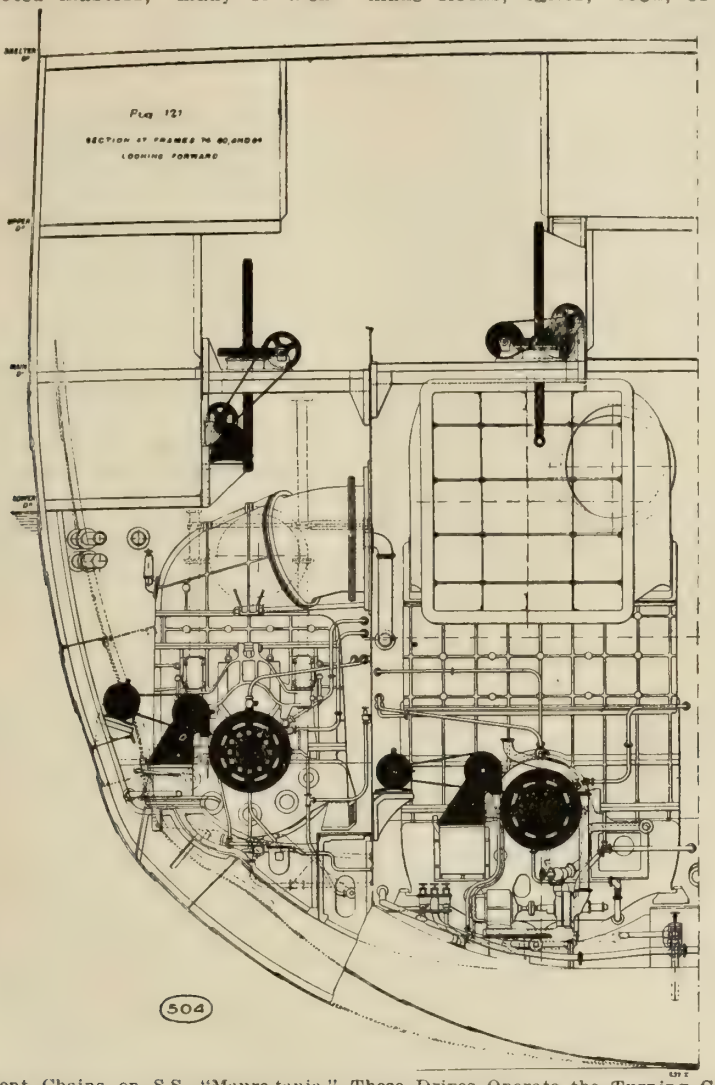
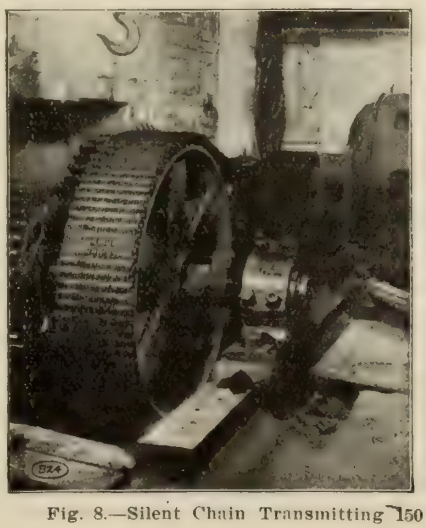


Fig. 9—Silent Chains on S.S. "Maure tania." These Drives Operate the Turning Gears for the Propeller Shafts and Turbines Respectiv ely.

A Trade the Best Legacy.

A man who teaches his boy a trade provides more certainly for his future than if he leaves him a large property, but without knowing how to turn his hand to useful employment. The ancient Hebrews had a saying: "He who does not teach his boy a trade, leaves him to a thief." It is almost as true to-day as it was in any period of history. A university diploma is by no means an insurance against lack of work. a man who can fashion a horseshoe, make furniture, mould, engrave, varnish, make clocks, tailor, cook, or build a house, is not long out of employment. If he can do either of these things well, and is willing to work, he need never walk the streets seeking for work and not find it.



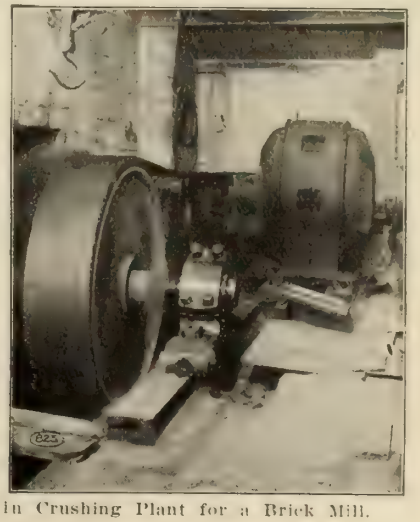


Fig. 8.—Silent Chain Transmitting 150 H.P. in Crushing Plant for a Brick Mill.

MEETING OF THE FOUNDRY EXHIBITION COMPANY.

A meeting of the board of directors of the Foundry and Machine Exhibition Co., was held in Buffalo, Friday and Saturday, Sept. 15 and 16, for the purpose of investigating the exhibition facilities afforded by the large halls in that city. While no definite arrangements have been made, it is altogether probable that a hall suitable for the use of the Exhibition Company will be obtained, the final decision having been left with the executive committee. The American Foundrymen's Association and the Associated Foundry Foremen were also represented, and preliminary plans were discussed for the annual foundrymen's meeting which will be held in Buffalo next year.

As usual, the exhibition feature of these conventions is usually a financial success, and Pittsburg was no exception. The directors of the Foundry and Machine Exhibition Co., declared a 20 per cent. dividend, payable immediately to all exhibitors who were represented at two successive exhibits. To those who displayed their product in Pittsburg for the first time, this 20 per cent. dividend will be held in reserve and if they exhibit in Buffalo, this dividend will be returned to them.

Officers for the ensuing year were elected as follows: President H. R. Atwater, Osborn Mfg, Co., Cleveland; vice president, R. S. Buch, A. Buch Sons, Co., Elizabethtown, Pa.; secretary, C. E. Hoyt, Lewis Institute, Chicago; treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburg. Executive committee, F. N. Perkins, Arcade Mfg. Co., Freeport, Ill.; E. H. Mumford, Mumford Molding Machine Co., Plainfield, N.J., and R. S. Buch, trustees, three years, Henry A. Pridmore, Henry E. Pridmore, Chicago; J. W. Campbell, Cleveland Wire Spring Co., Cleveland, and R. S. Buch.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

TIRE LIFTING GRIPS

By R. N. Saunders, Montreal.

THE accompanying cuts show a useful form of lifting tackle, which has been found to greatly facilitate the rapid handling of locomotive and coach wheel tires between the boring mill and the shop floor. Fig. 1 shows the construc-

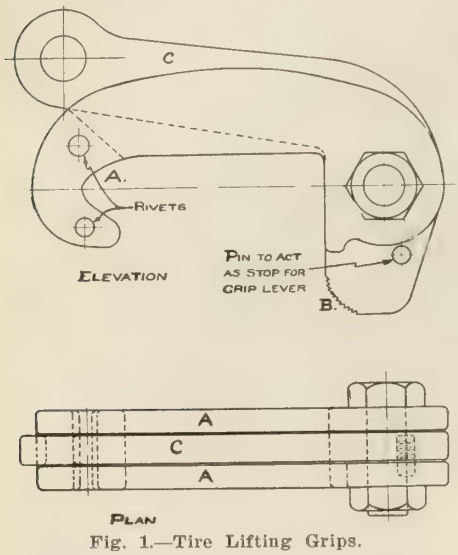


Fig. 1.—Tire Lifting Grips.

tion of the grip which consists of a bent lever, C, having its lower edge serrated and hardened, as shown at B. This lever is fulcrumed between two plates, A, shaped at one end to fit over the flange of the tire. A distance piece is riveted between the plates at this end to prevent them spreading. The fulcrum for lever C consists of a $\frac{7}{8}$ inch bolt. The small pin or stud shown in C, is intended to prevent A from falling into line with the lower arm of C, when the grip is lifted from the floor preparatory to being placed on the tire. It has been

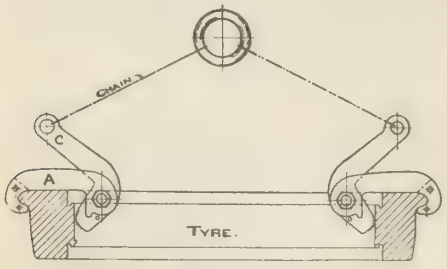


Fig. 2 -Tire Lifting Grips.

found of little practical value, however, and usually gets broken off in a short time.

Fig. 2 shows a pair of grips completed with their chains and ring. It will be seen that they are only adapted for lifting a tire in this one position—that is, with the flange uppermost.

Editor's Note.—We invite sketches and descriptions of a grip suitable for lifting a tire in the opposite position to that shown in Fig. 2, i.e., with the flange downwards. All designs must have been given a successful practical trial. Any design accepted will be paid for at our usual rates.

A PNEUMATIC FEED FOR AIR DRILLS.

By F. G. Goddard, Montreal.

The device herein described was designed for drilling locomotive saddle-bolt holes in the erecting shop after the boiler is in place, at as high a rate of speed as could be obtained in the machine shop on a radial drill. A small air cylinder fitted with piston, guide-bars and crosshead is attached to an air motor by means of a coupling, Fig. 2, screwed into the motor in place of the usual feed screw. This coupling is also attached to the end of the guide-bars in such a way that the motor is free to rotate on its axis, this condition being necessary to relieve the guide-bars of all twisting strain when drilling.

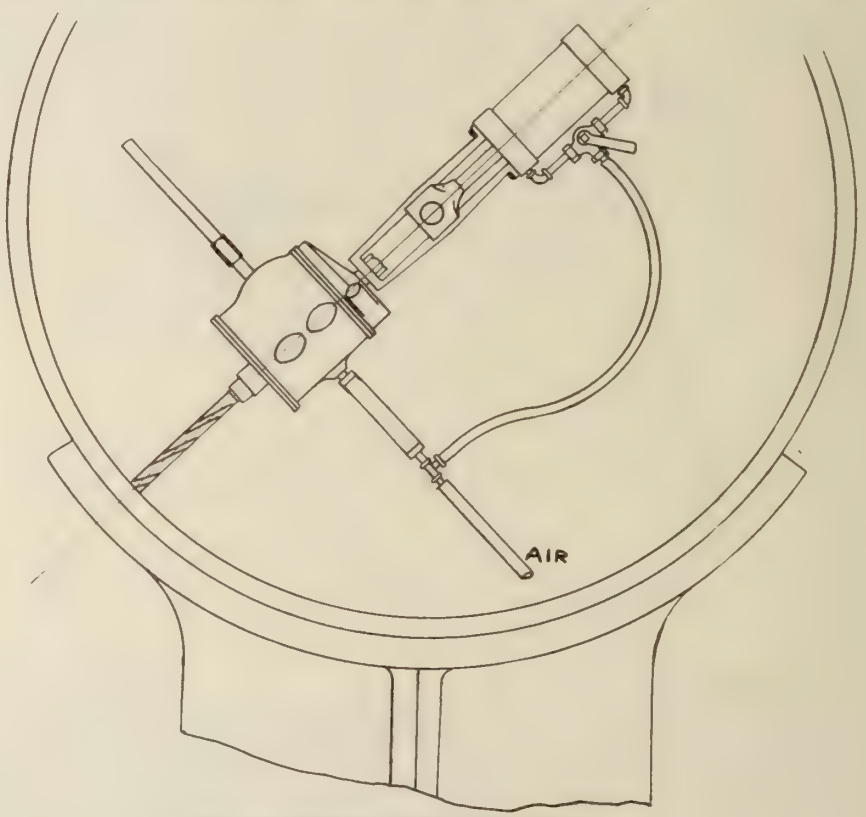


Fig. 1.—Pneumatic Feed for Air Drill.

When in operation, a 2 inch round bar or pipe of extra heavy section is rigidly stayed in the centre of the smokebox by means of two spiders, Fig. 3 ; the motor and cylinder being suspended between the spiders on the bar which passes through a 2 inch hole in the crosshead. The air supply to the cylinder is tapped off the motor supply by means of a tee and short length of hose to a three-way cock on the cylinder. It can be manipulated to give exactly the requisite amount of pressure to feed the drill, or on being reversed, backs the drill out of the hole. As the crosshead and piston are attached to the 2 inch bar, they remain stationary when air is applied ; but the cylinder moves either up or down, and with it the guidebars and air motor. It will be noticed that every hole thus drilled is perfectly radial from centre of the smokebox. The apparatus was so designed that drills of average length could be used in smokeboxes of the smallest diameter ; consequently in those of larger diameter drill sockets or extensions must be used to make up the length, so that the point of the drill swings 1 or 2 inches clear of the inside of the smokebox when in the back-up position.

When drilling, the motor should be at its full speed before any feeding pressure

is applied, and a chalk mark should be put on the drill to show when it is about to point through the outside of the saddle, at which juncture the air feed must be shut off and the drill al-

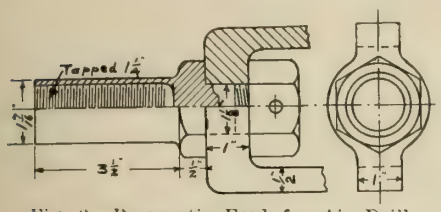


Fig. 2.—Pneumatic Feed for Air Drill.

lowed to go through by its own weight, otherwise it is liable to jam or break the point of the drill. If properly handled and using high speed drills, saddle-bolt holes can be drilled in this manner at the rate of one every 1½ to 2 minutes, and the time required to change from one hole to another is but a few seconds. The device was originally intended for use in the case of new cylinders being applied to a repair engine, but it was afterwards found that a great saving in time could be effected in the case of new engines, by punching the holes in the smokebox, before rolling, and then drilling the saddle as described after the boiler is in place on the cylinders. It has also been used to advantage for drilling out old saddle-bolts when stripping boilers.

The correct size of cylinder was only arrived at after one or two trials. Finally, a diameter of 5 inches, with an air

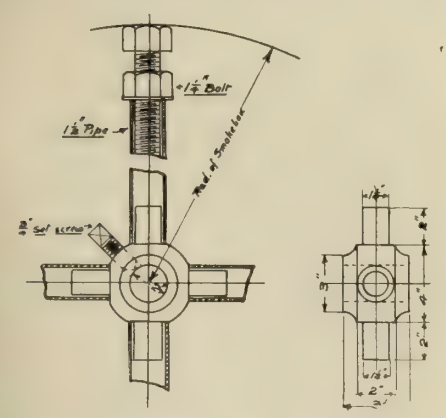


Fig. 3.—Pneumatic Feed for Air Drill.

pressure of 70 to 80 pounds was found to give a fairly heavy feed to high speed drills up to 1⅛ inches diameter. The stroke of the cylinder is 8 inches.

CUTTING KEYSEATS ON A LATHE.

By H. E. Fozard, Ottawa.

Time may often be saved when keyseats are required to be cut on a job already in the lathe. The saving consists in obviating the necessity to remove the work from the chuck and the consequent setting-up on another machine. Ablute accuracy of performance is at the same time secured. The following example describes the method and apparatus involved.

Assuming that a keyseat ¼ inch wide is to be cut in a hole 1 inch diameter. Take a piece of ¼ inch square tool steel, grind clearance as for cutting-off tool and place in boring bar, with cutting edge at right angles to lathe bed. Set the centre of the tool level with centre of the hole to be keyseated and wind saddle backward and forward, feeding to the required depth with the cross slide rest. By this means, it is possible to cut keyseats up to ½ inch wide. When cutting soft steel and cast iron, it is necessary with the larger size keyseats to put a small tool through first, afterwards finishing with a tool the required width.



Knurled Burnishing Tool.

I may say that the actual cutting time compares very favorably with that taken on a shaping machine.

NOVEL METHOD OF FLUTING SMALL BURNISHING TOOLS.

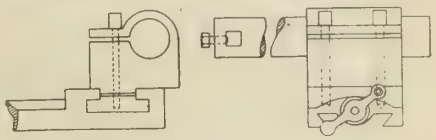
By Chas. Hattenberger, Buffalo.

The firm with whom I was employed used large numbers of small barrel cams. The cam-way was about 5-16-inch deep. Owing to the extreme accuracy required, the usual method of machining the cam-way was to mill it .00005-inch under size, and then finish by burnishing. It was customary to make the burnishing tool of high speed steel; turning the blank .010-inch over size and then milling flutes about 1-32-inch apart. The tool was afterwards hardened and ground. Because of the quantity used, this milling operation proved rather expensive, therefore, to cut down cost, we adopted the following plan. We turned the burnishing portion of the tool to the exact size and then knurled it. The knurling increased the diameter by about .010-inch. In grinding to size, small right and left hand flutes were thereby formed. This method of fluting made a smooth job and reduced the expense very materially.

DRILLING JIGS FOR IRREGULAR HOLES.

By A.D.C., Hamilton.

When drilling out blanking dies or any other holes of irregular shape, much time can be saved by the use of the little jig here shown. Ordinarily when drilling out such dies a lot of time is lost, in so locating successive holes that they will just break into the one previously drilled. This trouble is overcome by this jig which consists of a piece of machinery steel in which a hole is drilled equal to the size of drill for which the jig is to be used. Into this first hole there is driven a piece of hardened steel which is allowed to project a short distance beyond the bottom as shown. A second hole, a shade larger, is now drill-



Boring Tool for the lathe.

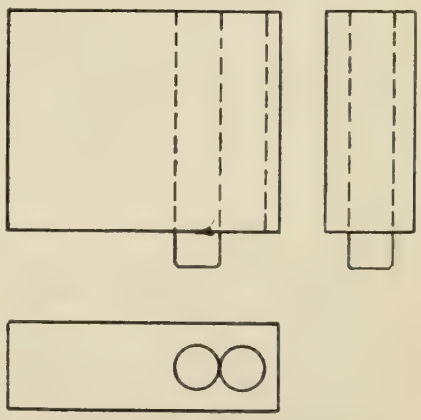
ed so as to just touch the first hole, and the jig is complete.

To use it, drill one hole in your die in the usual way; then insert the projection on the jig in the hole so drilled and bring your drill down into the second hole in the jig. Simple, isn't it? The drawing shows a jig for a ¼ inch drill.

BORING TOOL FOR THE LATHE.

By W. B. Cook, Medicine Hat.

In our shop we use the boring and threading device here illustrated and find it a useful attachment for the engine lathe. As may be seen from the sketch, it is simple and easily made. The ordinary tool post is removed from the slide rest and the boring tool substituted for it. The two cap screws pass through the body, and are tapped into the base plate, clamping the boring bar



Drilling Jig for irregular holes.

and the tool holder itself at one operation.

The cap screw heads are square, and of the same size as the tool post screw head, so that one wrench fits all. The boring bar at one end is slotted through at right angles to the axis as shown. If the other end is slotted through at an angle of about 40 degrees and the bar cut off parallel to the slot, the tool will be able to handle most inside work. The cutter is of course set by turning the bar sightly in its holder.

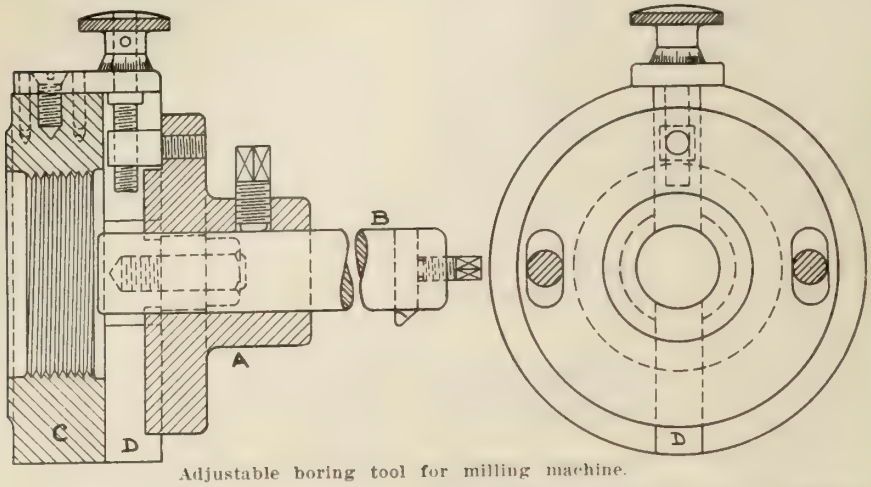
Such a tool as this is a useful addition to the small general shop.

ADJUSTABLE BORING TOOL FOR MILLING MACHINE.

By A.D.C., Hamilton.

In this tool, casting A carries the boring bar B, and slides across the face of casting C. A is guided in a straight line by means of a tongue which fits into the grove D, running across the centre line of casting C. The two studs in C, working in elongated holes in A, lock the boring bar after adjustment has been made by means of the micrometer screw. Casting C is screwed to fit the spindle of the milling machine.

This little attachment is easily made and has proved extremely useful in the tool room.



Adjustable boring tool for milling machine.

AN EXPANDING BORING HEAD.

By W.H.J., Toronto.

A simple form of expanding boring head is herewith illustrated. It is an invaluable tool in shops where a large amount of fine work is done. Referring to Fig. 1, it will be seen that a slot is milled in the tool body, which is of machinery steel. The two cutters are inserted in the slot and after they have been adjusted to size, the ring is screwed down, locking them securely in position. The ring is ground true on the back and hardened.

Adjustment is effected by means of the hardened steel adjusting screw, the point of which engages with the bevelled edges of the cutters and pushes them apart as it advances. The drawing shows a tool for boring any diameter from 3¼ inches to 3⅝ inches. Fig 2 shows the arbor for driving the boring head. This presents no special features, except that the driving tongue is not solid with the arbor, but is milled on a loose collar which is afterwards shrunk on and pinned. This method of construction reduces the cost considerably.

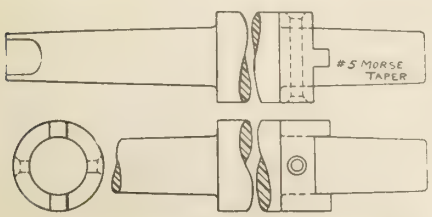


Fig. 2 –Expanding boring head.

FLOATING SOCKET FOR A FINISHING REAMER.

By L.E., Hamilton.

The sketch of this device needs little explanation as the construction is clearly shown. The socket floats on the points of four screws, allowing the reamer to adjust itself to the work. The holes in the ball head are made about 1-16 inch larger in diameter than the points of the screws. The sketch shows a socket for a taper shank reamer, but of course the idea is applicable to any style of shank.

MALLET LOCOMOTIVES ON THE C. P. R.

The Mallet articulated compound locomotives built during the present summer by the C.P.R. at their Montreal shops, are showing excellent results in service. They are stationed at Field, B.C., and work east from there to Stephen. Another will be turned out in October, differing from its predecessors, in being a simple engine with four high pressure cylinders, and making the sixth "Mallet" to be put into service by the company. Its performance will be watched with interest.

BOILING POINTS OF METAL.

In a paper presented at a meeting of the Faraday Society, London, Eng., H. Greenwood gave the boiling points of various metals at atmospheric pressure as follows:

	Deg. Cent.	Deg. Fahr.
Antimony	1,440	2,624
Bismuth	1,420	2,558
Copper	2,310	4,190
Lead	1,525	2,777
Magnesium	1,120	2,048
Silver	1,925	3,497
Tin	2,275	4,127
Aluminum	1,800	3,252
Chromium	2,200	3,992
Iron	2,450	4,442
Manganese	1,900	3,452

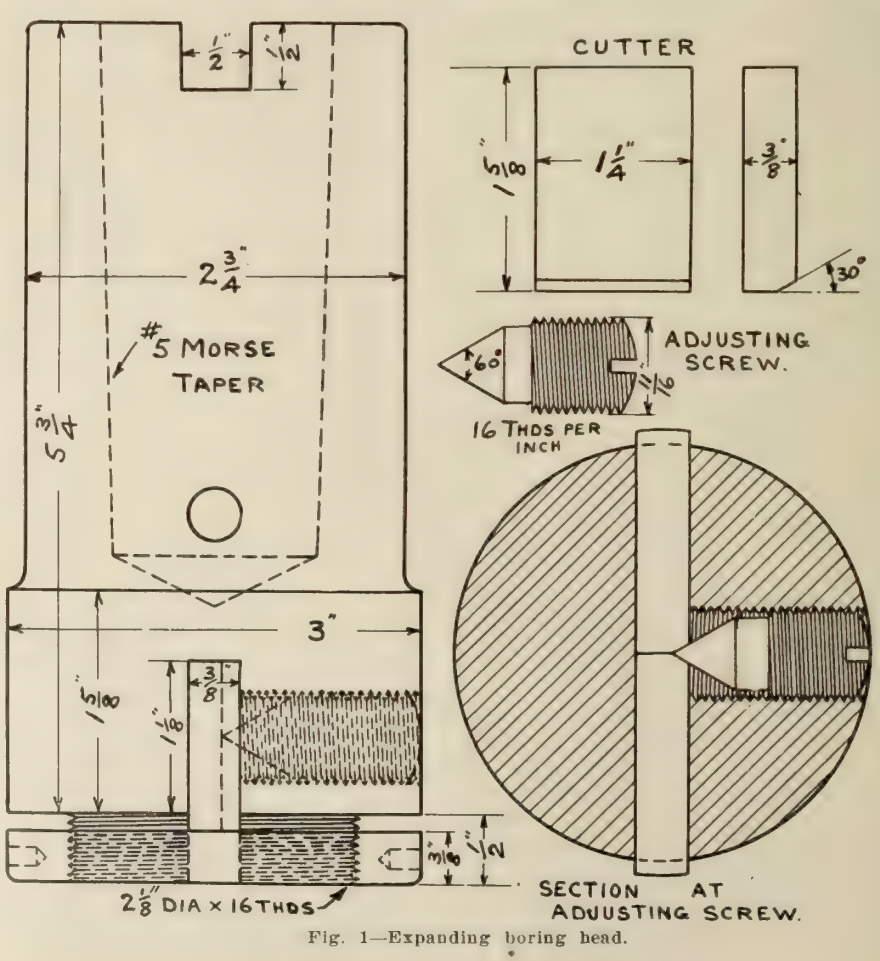
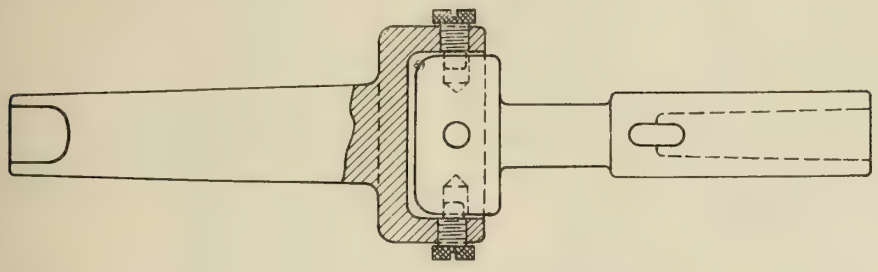


Fig. 1—Expanding boring head.

J. S. CONRADI, MANAGER THE POLSON IRON WORKS.

CONCURRENT with the announcement of the intended extension to the plant of the Polson Iron Works, the active management of the present plant and of the proposed works has passed into the hands of Mr. J. S. Conradi, late of London, England, whose record in marine engineering and shipbuilding, and management of industrial enterprises is bound to affect favorably the future of this old established plant.



Floating Socket for a Finishing Reamer.

Mr. Conradi was born at Glasgow, forty one years ago, and commenced his engineering career in the workshops of the late firm of Maudslay, Son & Field, of Westminster, who were probably amongst the oldest established and most famous engineers and boilermakers of their day. Besides repeatedly adding to their reputation as marine engineers by supplying the propelling machinery for a large number of battleships and cruisers for the British Admiralty, many of the mills in the Old Country are to-day running with engines built by them almost a century ago, and constituting a record which stands out at the present time, a monument to their skill as engine builders.

Having attained with this firm a thorough grounding in the practical details of engine and boiler building, Mr. Conradi, in order to gain experience in the running of marine engines, and handling and care of boilers under actual working conditions, joined the Ross Line of Steamships chartered by the New Zealand Shipping Co., trading to Australia, South America, the Gulf of Mexico and Canada, and during this service, amongst the other more or less exciting experiences of a sea-going engineer, he with others had to cope with a cargo of cotton afire in mid-ocean on two occasions, and to participate in a wreck experience on the coast of Florida.

Gaining four years valuable experience in this way, and obtaining Board of Trade certificates, Mr. Conradi joined the John I. Thornycroft Co., of Chiswick, Southampton and Basingstoke, the most progressive shipbuilders and engineers at that time in the world, and pioneers in the steel shipbuilding industry. Mr. Conradi remained with them for fourteen years, and besides acting as superintendent and manager for six years, was responsible for the speed and steam trials of many speed-record-breaking vessels built under his supervision. Amongst others might be mentioned, H.M.S. "Speedy," the first war vessel fitted with water tube boilers, and which attained what was at the time, the unprecedented speed of 21 knots an hour.

He was also directly connected with the building by this noted firm, of the first destroyers for the British Admiralty, their astonishing speed attracting the attention of many foreign governments—Germany, Italy, Japan, Sweden and others placing orders later, for similar vessels. The various classes of this type, ranging in speed from 27 to 35 knots per hour, held speed records in each instance. The most interesting of the many vessels built under his supervision are closely connected with historic events which will live long in the memory of the people of the British Empire. We refer to the stern wheel steamers built for the Nile expedition, which did such excellent service during the recapture of Khartoum under the command of Viscount Kitchener, and "Shamrock II," challenger for the America Cup, built for Sir Thomas Lipton. It will be remembered that the late King Edward nearly lost his life, when this yacht was struck by a squall and dismasted, owing to the fore-stay parting, while on a trial spin in the Solent.

Mr. Conradi was among the first in England to appreciate and adopt pneumatic tools to the construction of marine boilers. Illustrations of these tools and of his attachment for expanding the tubes in the lower drums are still being exhibited by the makers. The first steam turbine built and installed in a war vessel, became prominent during his connection with the Thornycrofts. Further, Mr. Conradi has had a good deal to do with the design and construction of internal combustion engines, and it was largely owing to the rapid advance made by this type of engine that he was led to consider the advisability of studying manufacturing conditions from a commercial as well as a practical standpoint, with a view to the reduction of production costs, and to the inauguration and adoption of methods, the success of which when put into practice, brought him into particular prominence in engineering circles in England, and resulted in the Vickers Co. procuring his services some five years ago, to carry out the re-organization of their London factories. The Vickers Co. are of world-wide repute, and as general manager and superintendent of their plants situated at Erith, Crayford and Dartford, Mr. Conradi was connected with one of the largest manufacturers of ordnance, ammunition, rifles and motor cars in England and perhaps in the world. He was elected a member of the Institute of Mechanical Engineers in 1892.

That Mr. Conradi's experience should be of value in this country goes without saying, and we think the Polson Iron Works are to be congratulated on having secured his services.

READER, WHAT DO YOU KNOW?

Among readers of Canadian Machinery there is a clearly defined sincerity of desire to know how each overcomes the daily tasks of the machine, pattern and blacksmith shops, the foundry and boiler shops. It is believed that your methods and devices, while good, may be improved, and thereby made more valuable if you publish them, so that other brains may work on them. We will provide the setting and pay you for the material. When your fellow tradesman puts the superstructure on your foundation, we pay him and pass the "kink" on to you, free. Get into the game.

In matters industrial, the path of peace and profit lies along lines which are truly educational.

New York still leads in water power development, with 885,862 horse-power. California is second and Maine third.

A decline in business permits sifting out the employes, the setting-up of new standards of efficiency and performance, the appraisal of the value of each individual workmen, the readjustment of operating costs and the curtailment of waste, all of which in their previous practice under full pressure, may have contributed more or less to the consumer's burden.

Such a contingency, is preferable to a slaughter of labor, or a stoppage in development and consequently waste of natural resources.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

A NEW TURRET LATHE.

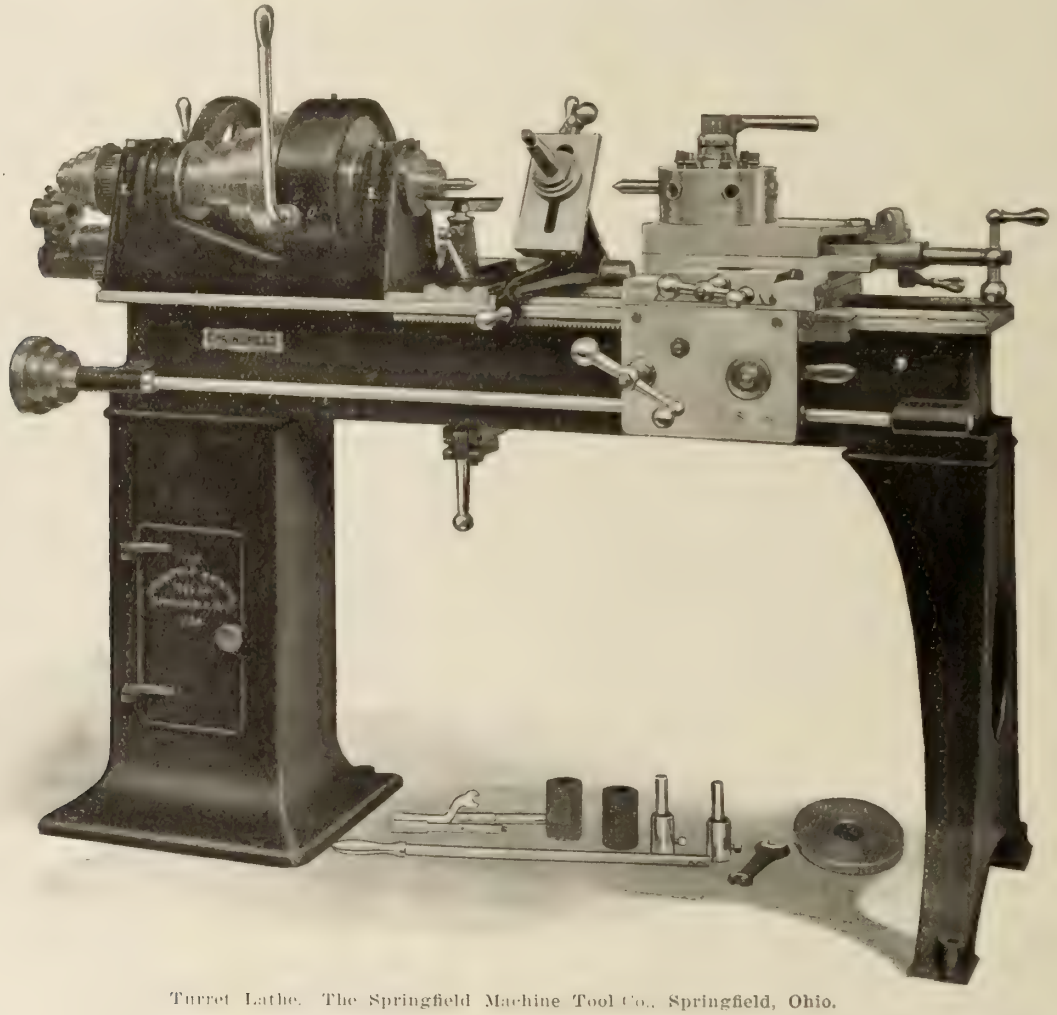
THE latest product of the Springfield Machine Tool Co., Springfield, Ohio, is a 15 inch by 5 feet cabinet turret lathe, which we herewith illustrate. It contains several new features and improvements, all of which have been introduced with a view to increasing the speed with which work may be handled. Thus, the turret is so designed that one slight backward movement of the blade loosens the turret and at the same time withdraws the locking pin ; a slight forward movement then produces the partial revolution of the turret for the next tool, and simultaneously locks and tightens it, the entire operation being done in a second or so by one hand.

The lathe is back geared, and has a four step cone pulley of large diameter. The spindle is of high grade steel and runs in phosphor bronze bearings. There is an automatic engine feed to the turret, with three changes, which may be reversed by the handle at the left hand side of the apron. Further, there is a longitudinal movement of the turret by either a lever or screw. The top slide of turret rests upon a lower slide having a right angle movement, hand-operated by means of a screw in front of the machine. This allows a large range for facing off work held in a chuck. When using this hand set-over, the holes in the turret can always be brought central again with the spindle by a positive stop. This latter can be quickly removed when tools are to be used back of the spindle centre. The slide has an additional cross movement operated by a supplementary taper slide ; the taper being derived from a bar between the ways of the bed, set by a graduated index to obtain any taper up to 4 inches per foot, thus obviating the necessity of setting over the headstock for taper boring or turning. With this taper attachment work can be faced off square when the job is completed, without any change.

When used for straight work, the taper side is locked to the saddle by a taper pin of tool steel, having a square head for its ready removal.

The machine rests on one cabinet and one plain leg, the former being fitted with shelving for the reception of tools, chucks, etc.

The lathe is driven by a 2 inch belt and its weight with a 5 feet bed is 1,535 pounds.



Turret Lathe. The Springfield Machine Tool Co., Springfield, Ohio.

BALL BEARING JOURNAL JACK.

AMONG late developments in lifting jacks, one which will be of interest to railroad and street railway officials, is an improved ball bearing journal jack recently placed upon the market. It is designed to facilitate the rapid and convenient removal or replacement of journal brasses in freight cars, passenger and Pullman coaches and is especially adapted to railroad service where short, light and powerful jacks are required. Notwithstanding its low cost, there is provided a positive stop which absolutely prevents raising the lifting bar out of the jack. Another important feature is the adjustable wheelholding device designed to hold down the wheel when operating. This device is very essential under many conditions, and may be

easily detached when not required. The two features just described are also strong factors when considering safety of operation

All gears are forged with machine cut teeth; and, due to its scientific construction, the jack is light in weight and easily handled. The construction suggests ease of operation, as the load is raised only on the downward and most convenient stroke of the lever.

The Duff Mfg. Co., Pittsburg, Pa., are the makers of this tool.

AN EFFICIENCY COMBINATION.

SINCE Mr. Brandeis made his famous "Efficiency Declaration" before the Inter-State Commerce Commission, this word has been much used in all industrial lines but more especially in the railway service. "Efficiency" is generally paraded as something new. The fact remains, however, that machinery builders have for years been designing tools for no other reason than that they would be of a higher efficiency, or in other words, do better and quicker work than the older styles. When it was seen that certain types of tools had reached their highest individual development, manufacturers began to combine one or more separate tools. Pioneers in this work of development in wood-working tools for use in the car shop is the J. A. Fay & Egan Co., of Cincinnati, Ohio. One of their combination productions is illustrated herewith. It is known as the Fay & Egan Combination No. 214 Vertical Hollow Chisel Mortiser and No. 150 Automatic Car Gaining Machine, with boring attachments.

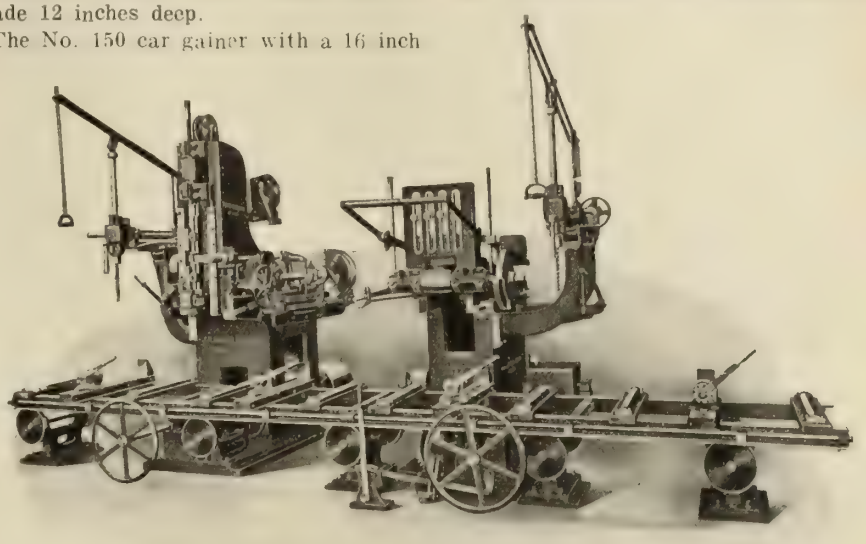


Ball Bearing Journal Jack.

Railway mechanics will be quick to appreciate the manifold advantages of being able to place a heavy timber on one carriage and do all the mortising, gaining and boring required, without having to carry the work about the shop. If gang boring can be done to advantage, the manufacturers' No. 163 multiple boring machine is added to the equipment.

The hollow chisel mortiser used in this combination is of the most powerful type built. It will mortise from ½ to 3 inches square and 6 inches deep. By reversing the timber, the mortise can be made 12 inches deep.

The No. 150 car gainer with a 16 inch head will cut a gain 5 inches deep in timbers up to 20 inches thick and 24 inches wide. The cut can be made on either the forward or return movement, or both ways as desired.

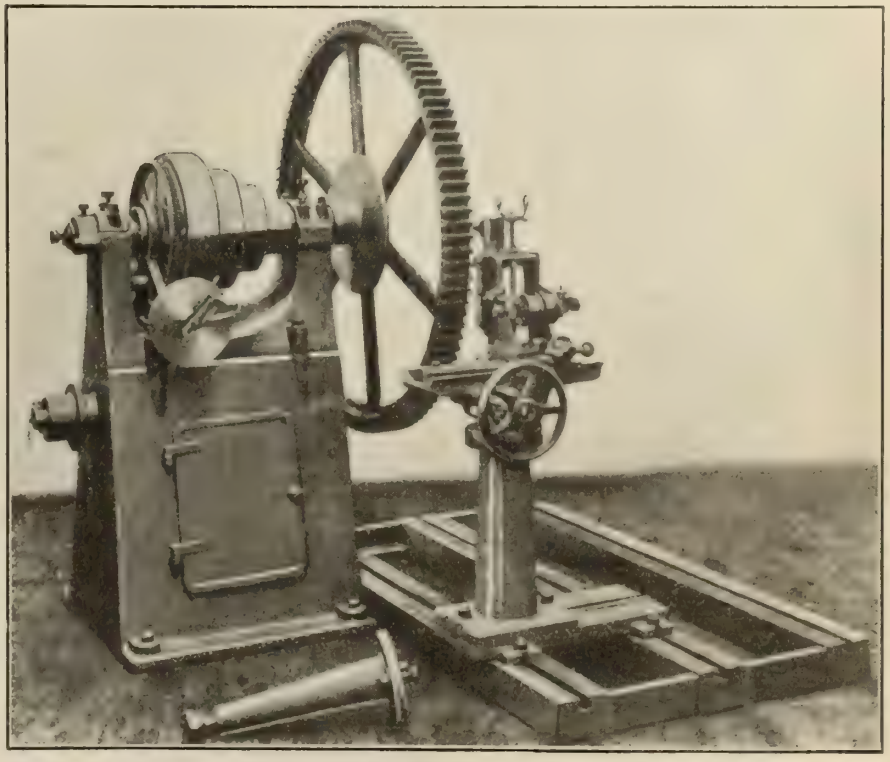


Combination No. 214 Vertical Hollow Chisel Mortiser and No. 150 Automatic Car Gainer Machine.—The Fay & Egan Co., Cincinnati, O hio.

MACHINE FOR CUTTING GEAR PATTERNS.

WE illustrate herewith a machine which has been designed by A. Ransome & Co., Stanley Works, Newark-on-Trent, England, and is built by them for cutting teeth on the patterns of spur or bevel-wheels of any diameter up to 6 ft., and of any pitch. The same machine can also be used for turning the wheel patterns before cutting the teeth. The mandril runs in long adjustable gun-metal bearings, and is fitted, as shown in the view, with a four-speed cone, which comes into play when the machine is used as a lathe. Double-thrust ball-bearings take up the end play of the spindle.

A dividing apparatus fixed to the head stock is provided for accurately cutting the teeth; it can be adjusted for teeth of all numbers up to 50, and in some



Machine for Cutting Gear Patterns. Makers, A. Ransome & Co., Newark, England.

cases up to 312. There is no difficulty in fitting the machine with dividing plates, for other numbers of teeth. The dividing apparatus, which is thrown out of gear when the machine is used as a lathe, consists of a worm-wheel 17 in. diameter, driven by a worm with dividing-plate for the required number of teeth. The plate is made with concentric circles, each circle having differently spaced holes, there being provided an

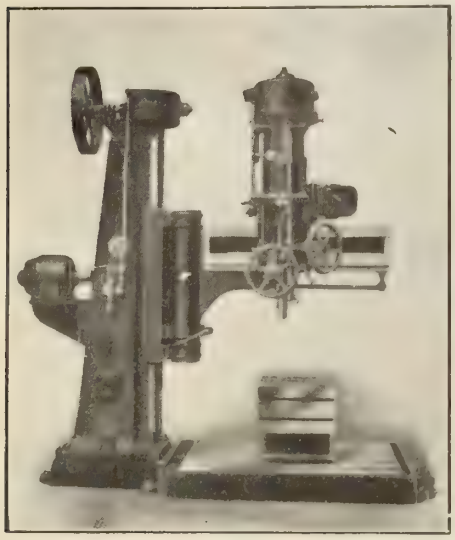


Fig. 1.—Hydro-Pneumatic Drill.

adjustable stop for accurately measuring the exact number of holes required for the various numbers of teeth.

The teeth are cut by means of a spindle running in ball-bearings, fitted with a steel cutter-holder, and driven by a light belt from the overhead countershaft. The spindle is supported on a carriage having a vertical adjustment for setting the cutter exactly central with the wheel, and a fine screw adjustment for setting to the exact depth of tooth. The carriage is traversed by means of a rack and pinion operated by a hand-wheel. The apparatus is also made with a swivelling motion for cutting bevel or mitre-wheels; it can be easily adjusted on the bed to suit wheels of various dimensions.

HYDRO-PNEUMATIC DRILL.

THE Walter H. Foster Co., 50 Church St., New York, have lately put on the market an interesting type of radial drill, which is illustrated in Fig. 1. The most noticeable difference from standard types of radial drills lies in a combination of the saddle on the arm and a cylinder with gear box on top, containing high and low speed gears for variation of spindle speeds, in connection with a variable speed motor. The cylinder, through which the spindle passes, is surrounded by an oil chamber, and the piston which slides in it is connected with the spindle. The latter revolves in the piston, and takes its thrust on ball bearings. The spindle is driven by a D.C. variable speed motor, directly attached to the cylinder through a set of gears, which gives two speeds of spindle for each motor speed. The spindle may be made to rotate in either direction through a drum type controller, and when used for facing or tapping, may be operated by a hand wheel.

The vertical movement of the piston, or in other words the feed of the drill, is obtained by the admission of air at about 80 pounds pressure to the top of the piston. Below the piston the cylinder is filled with oil, and on the admission of air to the top of the cylinder this oil is forced through a graduated valve into the chamber surrounding the cylinder. To raise the spindle again, air is admitted to this chamber, forcing the oil back and thus raising the piston and spindle. The arrangement gives a steady feed, and the absence of backlash reduces to a minimum, the danger of breakage should an extremely hard spot be met with, or when breaking through at the finish of a hole.

A constant speed motor is provided for raising and lowering the arm, or fast and loose pulleys are furnished if desired. A feature of the head is its adaptability to other makes of radial drills on which the drill head may be so much worn that considerable expense would be necessary to repair it. Should the base, column and arm of such a drill be in fairly good condition, the application of the hydro-pneumatic head would, it is thought, result in an up-to-date machine,

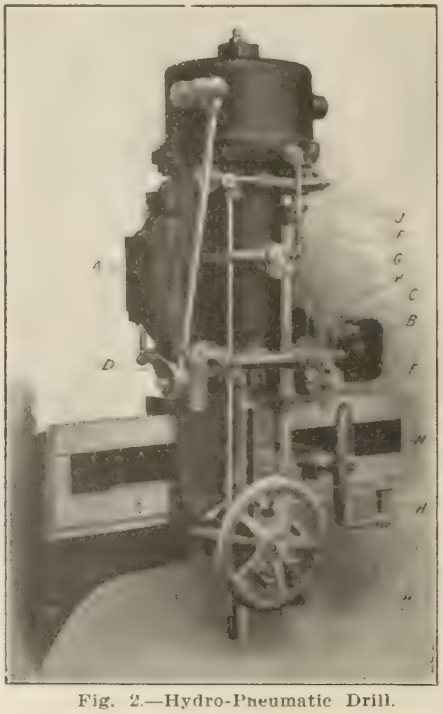
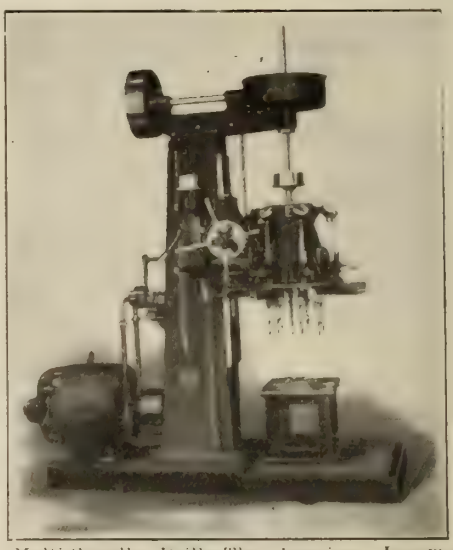


Fig. 2.—Hydro-Pneumatic Drill.

absorbing considerably less power than a geared machine, and capable of driving high speed drills to their full capacity.

The enlarged view of the head, Fig. 2, shows quite clearly the absence of moving parts. The motor is shown at A. The drum type controller B, is of new design, having ten points of contact, and has the resistance C, attached in a very



Multi-Spindle Drill The American Locomotive Co.

neat and compact form. The lever D, operates the high and low speed gears through a clutch.

The feed operating valve E, has a flat seat graduated to permit the passage of oil from the cylinder to the surrounding chamber and as the air pressure on top of the piston in the cylinder forces the oil, which is under the piston, through these graduated passages the feed is constant. The four way valve F, controls the passage of the air, whether it shall be on top of the piston forcing the spindle down, under which condition the oil is being forced into the chamber through valve E, or forcing the oil back into the cylinder under the piston, thus returning the spindle to its original position; the air valve is operated by the vertical shaft G, carrying adjustable trip dogs H.H., which are arranged to swing out of the way when the spindle is operated by hand, and not interfere with tappet I, which slides with the spindle.

The by-pass valves J and K, operated by lever L, through the connecting rod, allow the air and oil to pass freely in either direction while operating by hand. The hand wheel M, has pinion engaging with rack for hand operation of spindle. The hand wheel N, has spiral gear engaging rack for adjustment of head on arm.

ALL-GEARED MULTI-SPINDLE DRILL.

THE multi-spindle drill here shown was designed by the American Locomotive Co., for use in their automo-

bile factory at Providence, R.I. To drill the tough alloy steels used in the construction of the automobiles made necessary the bringing out of a multi-spindle drill which would give an equally high efficiency compared with other high-speed drilling machines.

The ordinary type of multi-spindle drill, in which the spindles are driven by universal joints, was found to be unequal to the strain, consequently in the present design, gears were employed for driving; universal joints being entirely eliminated.

The sales agents for this drill are the Walter H. Foster Co., 50 Church st., New York.

MULTIPLE DRILL FOR DRILLING MEAT CUTTER PLATES.

WE illustrate in Fig. 1 a large size multiple drilling machine of the raising table type. It was adapted for drilling meat cutter plates and equipped with six interchangeable heads, each with a different layout of spindles, and a table fixture for locating, holding and indexing the cutter plates during the process of drilling the holes.

Fig. 2 shows five of the interchangeable drilling heads, the sixth being shown in the machine with a drilling steady jig attached. Each head is furnished with a four leg cradle for safe keeping when not in use, and also to facilitate handling and adjusting it to and removing from the machine.

Fig. 3 shows the six cutter plates drilled with these heads. Above each plate is given the total number of holes; the number of spindles required to do the drilling and the number of operations. The distance between the holes in these plates is about 1 1-3 drill diameters.

Constructional Details.

The drilling heads are self-contained and are easily and quickly interchanged by means of the cradles before mentioned. The heads and spindle drivers are made of the best brand of bearing phosphor-bronze, and the drilling-spindle holes are bored to within .0005 inch limit as to location. The spindles are of tool steel, and cut out of the solid bar. They are hardened, tempered and ground true to size, and are fitted with pinch chucks for taking listed straight shank tongued wire twist drills. The steady jig mentioned is clamped to the lower end of the drill head and is adjustable vertically to allow the cutting end of the drills to project out just sufficiently to drill through the cutter plate. The steady jig shown is used on the four smaller heads, the only alteration required, being the exchange of steel plates containing the jig bushings that are held in place in the lower opening of the steady jig by screws.

Other heads with layouts of spindles arranged within a five inch circle can be used in this machine. The drill head casing is removable, and other casings may be fitted to take in larger heads, in which the spindle layouts are not larger than an 11-inch circle. The main driving spindle is 1 5-16-inch diameter, and runs in loose perforated bushings in both upper and lower bearings, thereby increasing the resistance to wear and heating-up, at high speeds. Lubrication to all high speed parts connected to this spindle, is affected through a capped brass oiler screwed into the upper end of the main spindle, the oil leading down through a hole drilled the entire length of the main spindle to the drilling head. The oil, in gravitating, and by its centrifugal tendency lubricates the upper and lower bearings. A separate oil well is provided for the upper bearing.

The Raising Table.

The raising table has a working surface of 12½ x 20 inches, and has an oil run on all sides, with an outlet on each end leading to the oil pan beneath. The table has a feed of 9 inches and is actuated by an 18 inch hand wheel through a pair of gears, pinion and rack. The leverage ratio of the table feed is 30 to 1. A stop screw is provided for drilling the required depth. The distance from the lowest position of the table to the end of the drills is 10 inches. The distance from the main spindle centre of the table to the inner side of the column is 6⅞ inches. The table supporting arm is adjustable and can be clamped at any height required. The supporting arm is raised and lowered by meant of the ratchet-pawl and rack-pinion method, and is located on the left-hand side of the machine.

On the table, Fig. 1, is shown the cut-

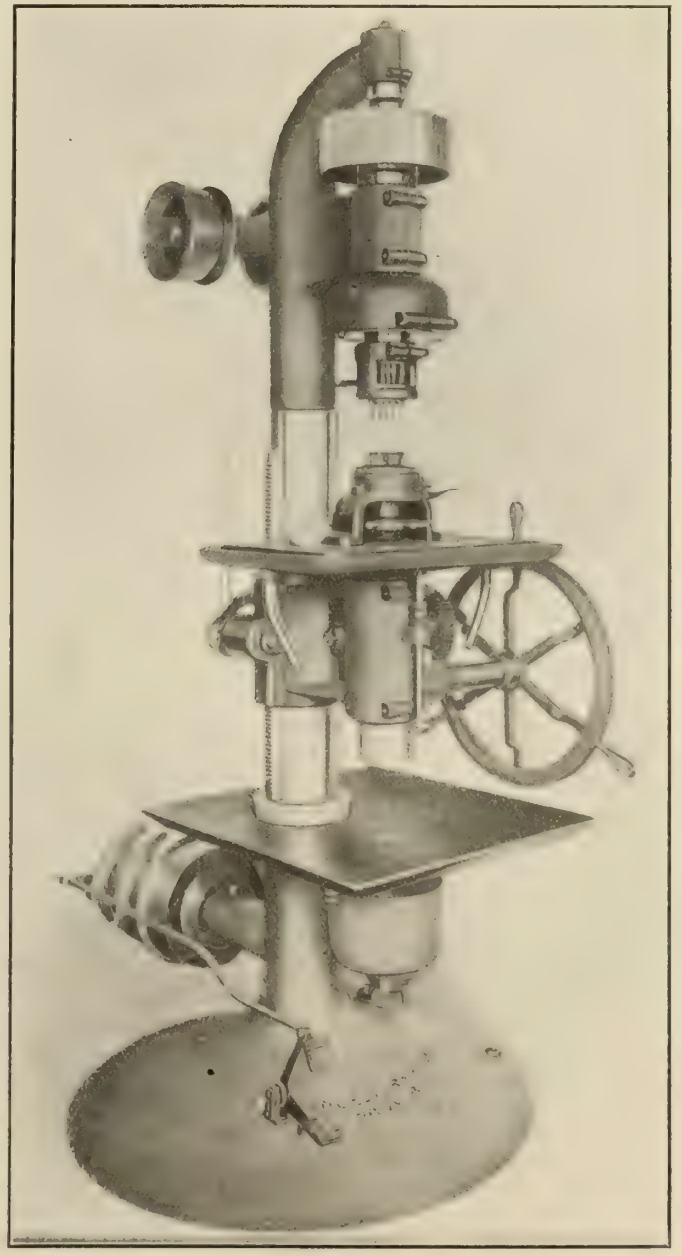


Fig. 1.—Multiple Drilling Machine, Raising Table Type.

ter plate fixture. It is centralized with drilling head and is fastened to the table by screws. The functions of this fixture are locating, holding and indexing the cutter plates for the operations in drilling. An expanding arbor projecting above the top face of the indexing head of fixture, both centralizes and holds the cutter plate by means of the hole in its centre. The cutter plate is seated on three short steel posts on indexing head. The arbor is expanded by means of spoked hand-wheel seen in front opening of fixture. An indexing head and expanding arbor are required for each plate and are easily and quickly interchanged. The indexing head of fixture is moved by hand and locked by a pin actuated by a downward pressure on small lever at the right.

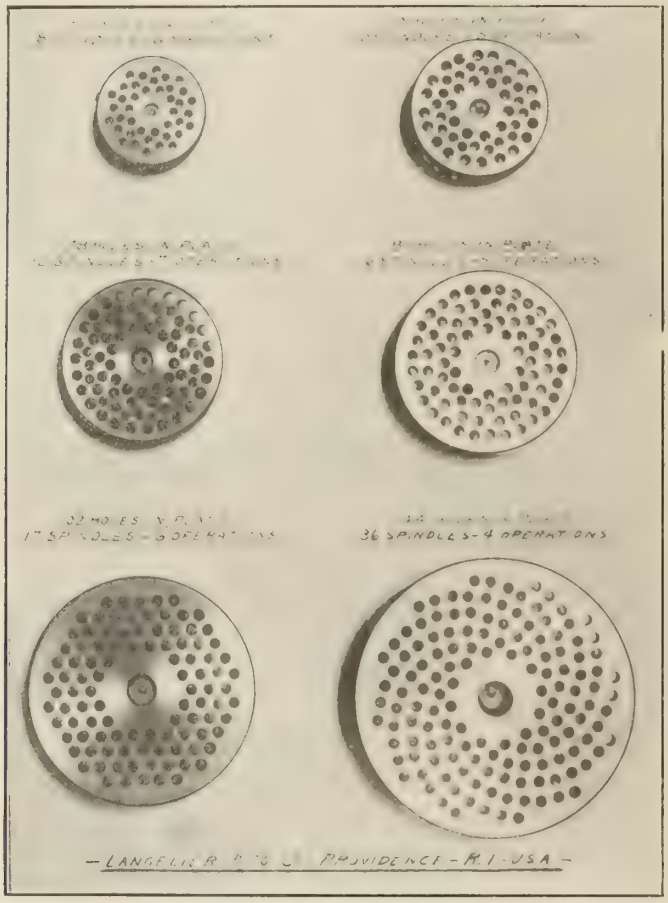


Fig. 3.—Drilled Cutter Plates.

Cutting oil is supplied to the drills by an oil pump. The oil after usage, gravitates into the lower oil pan and is filtered twice before entering the supply oil tank to be ready for use again. On the base of the machine is located the tight and loose pulleys, the pump and driving pulley for the quarter-turn belt. All of these are fitted with loose perforated bushings. The machine is started and stopped by a foot belt shifter. The main spindle and drill head spindles run at 800 r.p.m.; the floor space is 33 inches; by 42 inches; the height, 6 feet 8 inches; and the net weight about 1,750 pounds. The Langelier Mfg. Co., Providence, R.I., are the makers of these machines.

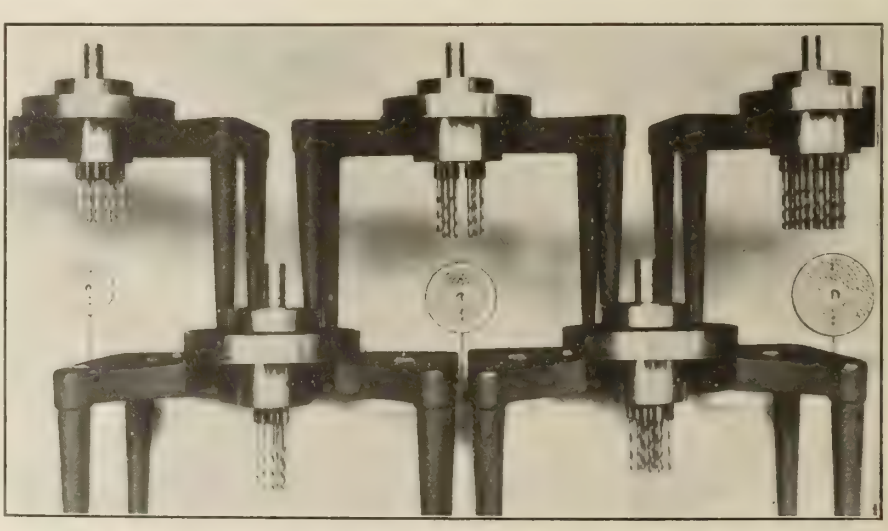


Fig. 2.—Interchangeable Drilling Heads, Multiple Drilling Machine.

A FIRST IMPRESSION.

There is a saying that first impressions are lasting. These first impressions that many a visitor gets in a shop come to him from the reception or waiting room. If he is discerning, what does he think of the uptodateness of the concern when he finds before him a table covered with a motley, disordered collection of magazines and periodicals with the uppermost ones months old? If his call is in August, he may pick up at first a paper of December of the year before, or a journal of the preceding February, or a magazine of March. A very little of the ambitious office boy's time would keep the files of regularly received periodicals up to date, with the current number on top. This is a small matter, but one, that properly attended to, promotes an air of general efficiency. —Ex.

BOTTLED SUNSHINE.

When a man in the States makes up his mind to "get on or get out," his efforts to get-rich-quick are a perfect godsend to the financial specialists in this line. Two such specialists have recently obtained $1,000,000 from persons in a hurry to speculate on "bottled sunshine." The imposture shows commercial enterprise worthy of a better cause. The organizers duly worked up their publicity department, "plants were erected in New York, Philadelphia, Baltimore and other cities." Each "plant" comprised a series of mirrors to catch the sunshine, wires carried the energy from the mirrors to certain storage jars; to these jars incandescent lamps were connected. When the sun shone the lamps lighted up beautifully; it was marvellous how those little mirrors could keep a great bank of lamps going. Even quantitative data were supplied to the spectators. one sunny day would light any office building for a week. Some fool of an electrician must have thrust himself in, however, and before the patentees could get aboard the lugger with their swag, the Federal authorities laid hands upon them.—Meteor. E. T.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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Cable Address:

Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. VII. October, 1911 No. 10

EDUCATION AND ABILITY.

IN another part of this issue of Canadian Machinery will be found a short illustrated descriptive article covering the Montreal Technical School. This recently opened and expensively equipped institution owes its being, as do others under project in leading cities of the Dominion, to a laudable desire to provide adequate facilities for the acquirement of a technical education by those engaged or about to engage in industrial enterprises as operatives.

Experience goes to show that many men of education, technical and otherwise, are and have been in the positions occupied, much in the nature of the "square pin trying to fit into a round hole." In other words they lack ability, that subtle inborn talent which suits a particular sphere and utilizes much or little education to adorn it. We are disposed to think that the broadcast dissemination of technical training will tend to an increase of such undesirable contingencies, unless steps are taken to determine a student's native ability and aptness for a particular profession, previous to the unloading of theory or technicalities on him by means however skillful.

It is a general experience that most things are improved by cultivation, therefore, the imparting judiciously of technical education will improve the operative in our workshops and factories. Men are endowed with a diversity of gifts, some have a number, some apparently, have one only, or, generally speaking, a very few. Some have brilliant gifts, while others are more commonplace. There are men who will make good and forge ahead, irrespective of technical schools, and there are those again, who need the training which the latter imparts. The true success of any technical school will not depend, however, on its equipment and facilities for imparting knowledge, but on its early sifting-out of each student's inherent bias, and training of him accordingly, so that he fills his proper niche to his own profit and to those with whom he may be associated.

Education, technical and otherwise, fits a man earlier to fill more perfectly his place as a workman and a citizen, but may not transform a man with musical gifts into a successful boilermaker. Much attention is devoted to a student's physique when considering his fitness for adopting a trade or profession, but little or no heed is given to the capacity of his brain and hereditary inclination.

CO-OPERATION.

IT is generally conceded that every enterprise which depends for its success on the aggregate efforts of a lesser or greater number of individuals, must have a more or less perfect co-operation of its units towards the desired end. While this is true, we are afraid that only a very limited realization, compared with what might be, is the daily universal experience. No sphere, in which we as individuals play a part, is exempt, for each, the political, the civil, the religious, the social, the domestic and the business world, shows that absence of co-operation and persistent personal presence, which make for strife and hinder progress.

In the business and manufacturing field, what do we actually find? Co-operation between employer and employees, between departments and individuals composing these departments, to the extent only, that some machine or other may be produced and sold to earn for all a previously determined or estimated return in gold. To attain this, organization, system and discipline of the highest proved efficiency are brought into operation. The spirit actuating the employer is neither humanitarian nor philanthropic, and we regret to say, that to an equal extent is the same true of the employees. Labor troubles would be of less frequent occurrence were the humanitarian aspect given more consideration by the former, and if a fairly large percentage of the latter realized of how little importance their "assumed officiousness" was to anyone outside of their own "charming" personality.

The exigencies of life determine in their unregenerate essence that the weak, unprotected and inequipped shall go under; yet no man or body of men dare practice or take advantage of this with impunity, by get-rich-quick schemes or other unworthy means. Co-operation on the part of the employer with his employees must to-day be real and unselfish, for the latter in ever-increasing numbers of labor's best element, are men, shrewd, educated and sensitive to injustice. Co-operation between manufacturing departments rests also largely with employers, for so long as output cost systems make it possible for one department to produce cheaply at the expense of another, to a corresponding extent, in this feature also, will there be always a spark of strife and a want of highest realization.

Co-operation among individuals comprising any department is in a majority of cases far from being as fully consummated as it ought. The desire to gain favor from superiors, and the unwise recognition of efforts in this direction by those to whom it appeals, and they are many and everywhere, is, we believe, the cause of more inefficiency and loss of monetary return, than is possible by either tyrannical proprietorship or departmental jealousy or both combined. The trouble is widespread, and none of us need look past our own nose for its evidences. So long as those in charge present an open ear for the reception of gossip from "suckers" instead of presenting them with a "good swift kick," just so long will there be lack of co-operation between employees, and diminished profits for the employer.

The Evolution of Armor Plate in the British Navy

By Frank Walker

IN 1860, the French Government launched and commissioned the line of battleship "La Gloire," possessing all the characteristics of the wooden vessels of that period, with the addition, that the free-board of her broadsides was protected for more than half its length by closely jointed wrought iron plates 10 centimetres thick. The "entente" at that time was anything but "cordiale," and Britain at once replied by building at the Blackwall yard of The Thames Iron & Shipbuilding Co., "The Warrior," our first "iron clad." The sides of this vessel were protected for about two-thirds length, by wrought iron plates 4½ inches thick, the plates being rolled at the Parkgate Iron Works, Rotherham, near Sheffield. "The Warrior" was launched in 1861, and work was thereafter commenced on an improved type vessel, "The Minotaur."

Armor Plate Development.

In 1862, the late Sir John, then plain Mr. Brown, perceiving that armour-plate had come to stay—with characteristic shrewdness, laid down at The Atlas Works, Sheffield, a complete plant for the manufacture of iron armor. This example was followed in the next year—1863—by Mr. Charles Cammell, of the Cyclops Works, and for a number of years after these two firms had the distinction of possessing the only armor-plate plants on British soil. That they reaped a golden harvest goes without saying. Their wages bill to workmen was of immense proportions. The plates were composed entirely of best puddled iron, and the demand for skilled workers far exceeded the supply, with the result that most extravagant salaries were paid to all employees. Those were indeed red-letter days for the iron worker; even such lesser lights as coal and ash-wheelers were paid wages which made the skilled mechanic squirm with envy. Puddlers, shinglers, ball-furnace-men and "muck" rollers, were simply coining money, while the "head-serangs," the armor plate rollers and furnace men, were in receipt of incomes which would not have disgraced high dignitaries of the church, etc.

Improvement in Guns and Projectiles.

The advent of armor naturally resulted in great improvements being made in naval guns and projectiles, and in order to afford protection against these, the plates grew thicker with each succeeding ship or class of ships, until in 1876, the climax was reached in "The Inflexible," the sides of which were protected by iron armor 24-inches thick.

About this time, Mr. — afterwards Sir Alex.—Wilson, of Cammell & Co., perfected and patented his compound armor plate. This plate, as adopted by the British Admiralty, consisted of a Bessemer steel face rolled on to a puddled iron backing, and its superior resisting power enabled naval constructors to cut down the thickness of armor by more than one half. This was not for long, however. Krupp, at Essen and Armstrong, at Elswick, kept things moving, and in order to resist their improved guns and shell, the thickness of the compound plate crept upwards by half inches and inches till it reached in "The Benbow," launched at Blackwall, in 1884, the thickness of 21 inches. Mr. Charles Ellis, of Brown & Co., stepped into the breach with an improvement in compounding, which caused things to remain stationary for a while, but the guns still continued to get the better of the argument. Then Harvey, the American, came forward and with his splendidly simple solid steel cemented plate.

The Harvey Armor Plate Process.

Taking advantage of the well-known characteristics that iron possesses of absorbing elements with which it is kept in contact for a length of time at a certain temperature, Harvey packs a low carbon open-hearth steel plate in charcoal and pure white sand; the charcoal being on the face of the plate and the sand on the back. Baking in a special furnace, at a temperature of 1,300 degrees F. for a period of from 12 to 14 days follows thereafter. By the cementation process, the face of the plate absorbs carbon from the charcoal, while in a like manner the back absorbs silicon from the sand. After special heat treatment and quenching, the super-saturated carbon face of the plate becomes intensely hard, while the siliconised back remains extremely ductile, and makes an ideal armour plate, at once compound and homogeneous. These plates had a superiority of 75 per cent. over the compound types, and were at once adopted by the Admiralty; the thickness of the belt and casements being reduced to 6 inches. This state of affairs did not last long, for the introduction of the long calibre, wire wound gun, the capped and chilled projectile, and higher powered explosives, called for further resistance, and we find on "The Canopus," built in 897, battery armor 72 inches thick.

The Krupp Cemented Plate.

The next important move in armor brings us to the present day, and to the Krupp cemented plate. This plate was the outcome of a better knowledge of the chemistry of steel and of the effect of mixing with it small quantities of various rarer metals. Steels made in this way are known as alloy steels and possess extremely high resisting powers. The original Krupp plate was made from open hearth steel containing 3.5 per cent. of nickel, 1.5 per cent. of chromium, and .25 per cent. carbon. Latterly, .15 per cent. of vanadium has been added. This plate is treated, as in the Harvey process, by cementation, and after a very refined series of heat treatments and quenchings in oil and water, becomes almost mechanically perfect for the purpose in view. A 12-inch plate manufactured under this patent in 1890, by Cammell & Co., successfully resisted three point blank shots from the 9.2 inch calibre naval gun.

The Introduction of Vanadium.

The enormously increased power of the modern gun has not allowed the armor to be greatly reduced in thickness of late years, but it is interesting to note that the introduction of vanadium was accompanied by a reduction of one inch in the thickness of the side armor of the "Super-Dreadnoughts." "The King Edward VII," "Dominion" and "Hindustan" had 9 inches, "The Lord Nelson" and "Agamemnon" 10 inches, "Dreadnought," "Bellephoron" and "Temeraire," 11 inches. While "The St. Vincent" and "Collingwood" with vanadium alloy, had 10 inches. These thicknesses apply to belt armor only and not to gun-shields or conning towers. In all probability, a return may be made in the near future to the compound plate, as an Englishman named Simpson has perfected a means of welding tungsten-alloy-steels, and a plate composed of 2 inches of tungsten steel rolled on to 4 inches of chrome-vanadium steel has been tested and found to be 50 per cent. superior to a Krupp cemented plate of equal thickness.

In conclusion, I would point out that the study of high-class alloy and carbon steels is one of absorbing interest, and I would commend it to all students of chemistry. Although we may not all become Wilsons or Harveys, yet we must remember that the steel industry is one to which the old adage does not apply, for the more cooks we have the better the chance for getting good broth.

The Brooks plant of the American Locomotive Company has been closed for an indefinite period, and 4,200 men are laid off.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

MAKING A BULLDOZER CASTING.

By Jabez Nall, Cleveland, Ohio.

IN the pattern-making and molding required for the production of the casting shown in general view, Fig. 1, and in side elevation and sectional drawings, Figs. 2, 3 and 4, respectively, there are several special features that may be of interest to readers of Canadian Machinery.

The Pattern Question.

Those affecting the patternmaker, and which he must take into consideration before commencing the actual work of making his pattern, are as follows: First there comes the method of molding. We hear much about consulting with the molder in such matters, but this is not always possible or satisfactory, when carried out, and as a rule it is up to the patternmaker to decide finally. For best results to this end, however, it is necessary that the patternmaker be familiar with up-to-date foundry methods, and have a practical knowledge of molding in all its branches. I have always tried to impress and interest the patternmaker in the foundry end of his business, but with indifferent results. Without this knowledge he is incapable of considering or comparing the cost of different ways of molding, and may construct his pattern in such a way that it adds unduly to the foundry cost of producing the casting. This, too, may be done with no saving in the cost of the pattern. It should be borne in mind that the pattern and the mold are but means to a desired end, i.e., a perfect casting, accurate in dimensions, of clean, solid metal, and as free from shrinkage strain as possible. The appearance of a casting is also an essential of quality.

In all large castings, and in many smaller ones, there is usually more than one way to do the job. For instance, this pattern could be made to mold on the side, and from the point of view of the patternmaker and of the molder, would present some advantage over the plan adopted. Smaller sizes, up to about 7 feet long, of other proportionate dimensions, and of similar design, I have made thus, with a good core print bearing on either side. The results were entirely satisfactory, due to the smaller amount of metal. Such a method does away with all loose parts of pattern—a very desirable feature, when it can be attained without sacrificing anything more essential. With a heavier casting it becomes a matter of doubt whether we would get solid, clean metal on the cope side, with an even contraction. The prime consideration in making the larger sizes by the method described in this article was to get the heavy part of the metal at the bottom of the mold, so gated that it had a chance to rise equally on both sides, thereby assuring as far as possible an even contraction. The result, as seen in Fig. 1, showns a perfect casting on all machined surfaces.

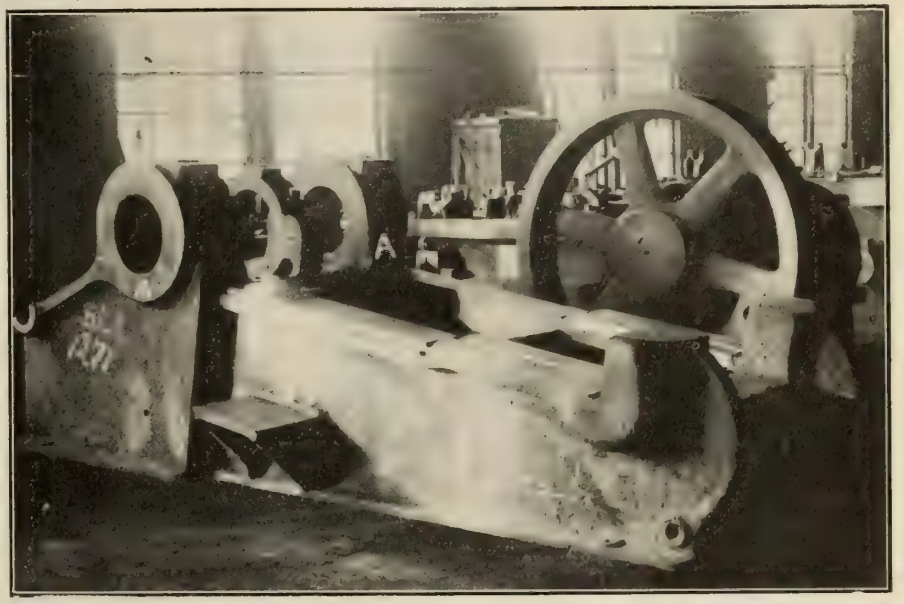


Fig. 1.

The casting being of steel, it was a question whether we would succeed in

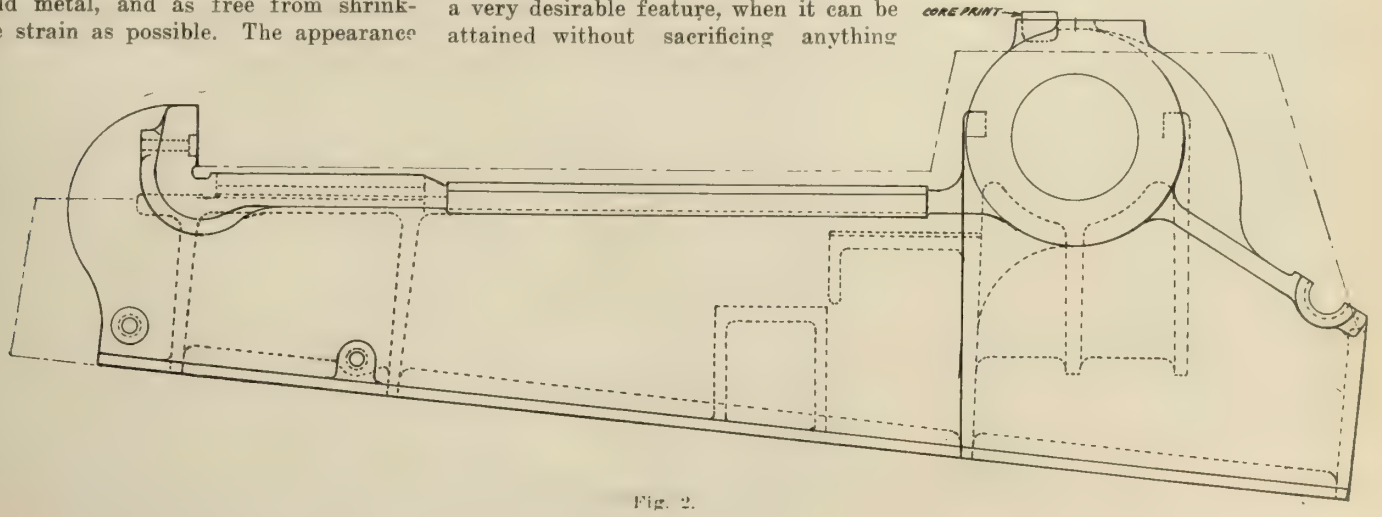


Fig. 2.

getting solid metal around the crank shaft bosses, as marked at A, Fig. 1. To ensure this, it was necessary to provide a feeding head for these bosses. This was done by adding metal, 6 ins. wide, through the lightening cores of the side girders, Fig. 7, and connecting with the heads on top of mold. Without this addition, the metal was not of sufficient thickness to prevent freezing of the top metal before the heavier metal below solidified.

Metal Considerations.

The question of the method of molding being decided, next comes the consideration of the metal from which the casting is to be made, and the consequent amount of shrinkage allowance to be made. In this connection, the design of the casting and distribution of metal must be taken into consideration, as well as the method of molding, because a fully-cored mold has a tendency to retard shrinkage. Usually a pattern-maker is apt to make too great allowance for shrinkage, rather than too little.

On these castings at first I made an allowance of ⅛-in. to the foot, but experience taught that this was full, therefore, I afterwards used 1-10-in. to the foot, which proved as nearly correct as practicable.

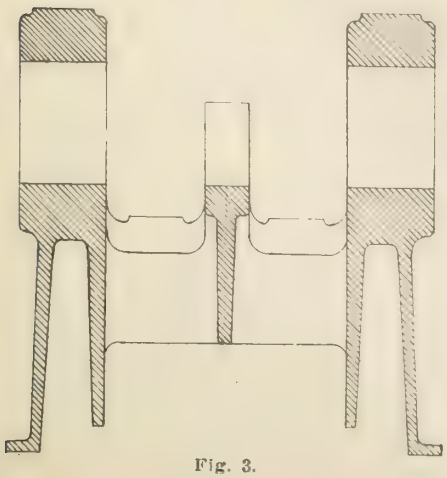


Fig. 3.

Working Layout.

These primary questions settled, the next requisite is a working layout of the job. For this purpose a full-size drawing of sections, as per Figs. 3 and 4, was made, having lines of core prints added, the importance of which will be recognized by the practical pattern-maker. We have seen much time lost on some jobs, in an effort to save making this drawing. Properly used, it is a time-saver and a preventer of errors, especially so where a number of men are working on the same job. On the other hand, we have seen time wasted by making a too elaborate working drawing, that had to be duplicated off-hand upon the work itself.

In this case, for the side elevation, the side boards were first got out from scale, then glued together and dressed off. The side elevation, as shown in Fig. 2, was drawn out on these, the position of the inside frames being laid off at the same time. As the pattern was of tapering height, this was essential to the correct making of the inside frames, of which, including the ends, there are seven. These frames being built upon the sectional layout, working from one centre line, the length of the upright was determined according to the position of each respective frame upon the side elevation. The framework was made of 1⅜x5½-in. stock, doubled in thickness, as indicated in Fig. 7, to the left, which shows the pattern in process of molding. With the frames made, the side boards were cut along the line of the offset at X, Fig. 5.

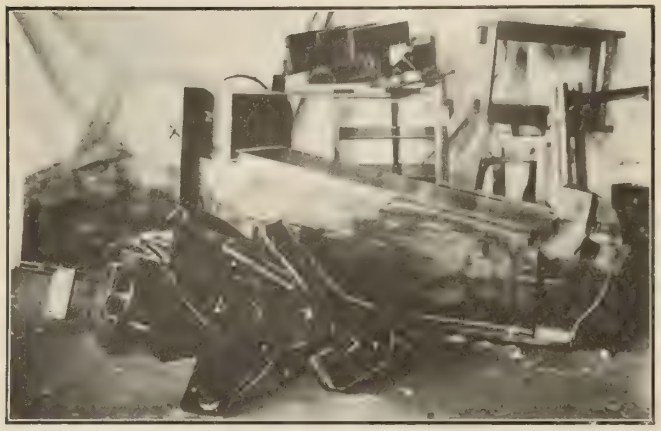


Fig. 5.

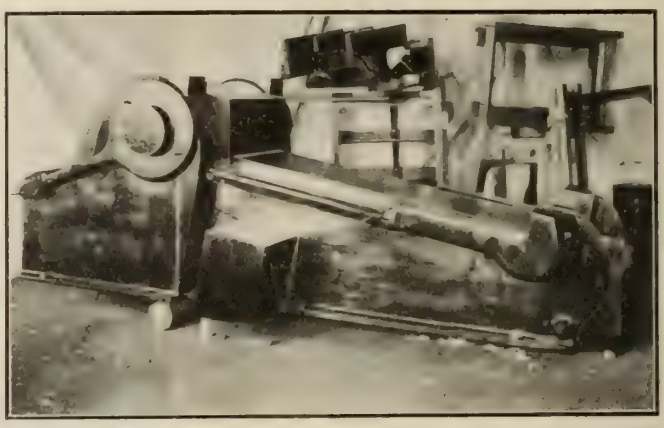


Fig. 6.

Figs. 5 and 6 give a view of the finished pattern, the former showing the loose parts removed.

The Mold.

The pattern being molded by the method known as "bedding-in-the-

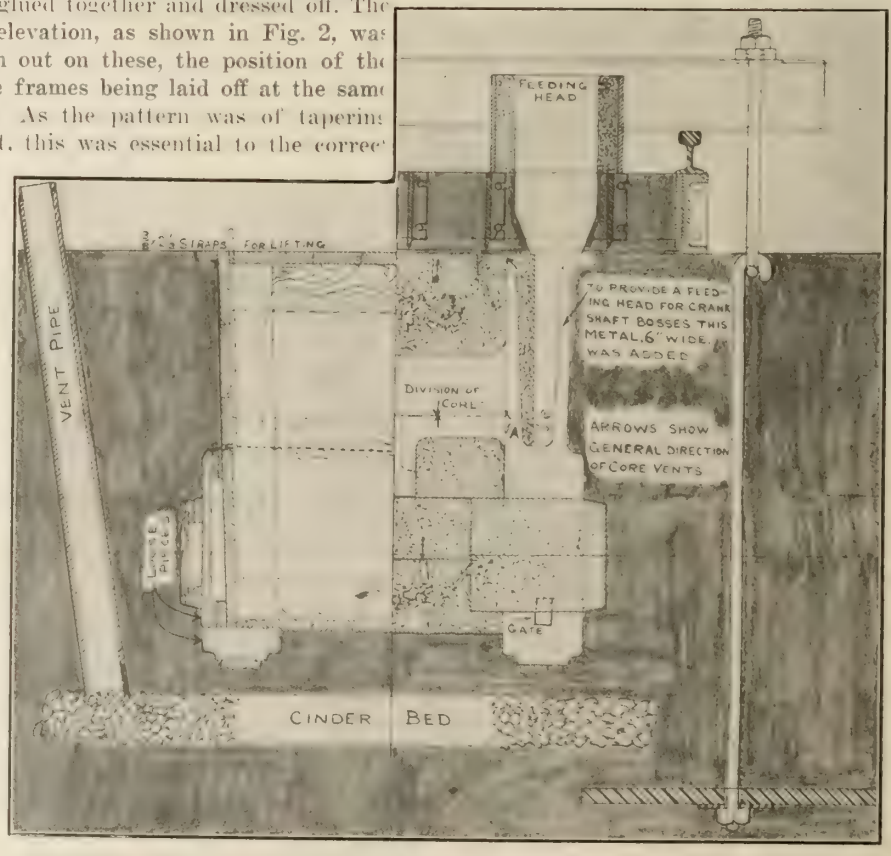


Fig. 7.

floor,'' the under side (when molding, it was, of course, inverted from the position shown in Figs. 5 and 6) was made as plain as possible, to facilitate the making of the bed. Several of the core boxes may be seen in the background, and are sufficient to indicate the division of the cores. Fig. 7 shows, to the left, a section of the mold, with the cope removed, ready to draw the pattern, and to the right, the completed mold. Details, such as rods, gaggers, bolt heads, etc., are purposely omitted to avoid confusion of lines. It is not our purpose to enter into a detailed description of the process of molding at this time, except only to note the method of locating the side cores, as shown at A, Fig. 7. Two or more chaplets were rammed up in each of these side cores, at a given line marked on the box, and left projecting the amount of the required metal thickness. Tested by template or gauge, a core print was placed at each side of the centre cores to form a place for the side cores to rest upon the chaplets aforementioned. This bearing against the centre cores assured the correct thickness of metal here. Afterwards, they were further secured by chaplets wedged on the opposite side to prevent movement under the flow of the metal.

In a steel casting of this length, with varying metal thickness and crop ribs, there is always the danger of shrinkage, strain and cracking or parting company at the corners. That this can be overcome by a judicious use of stitching or bracketing the corners, the use of chills and the casting-in of rods, is proved by the casting, as seen in Fig. 1.

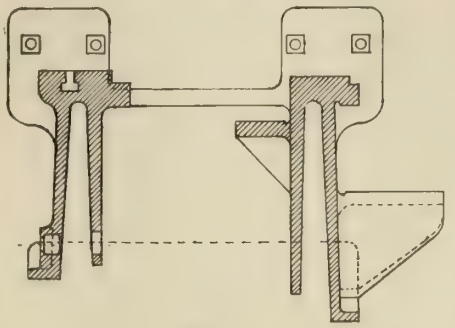


Fig. 4.

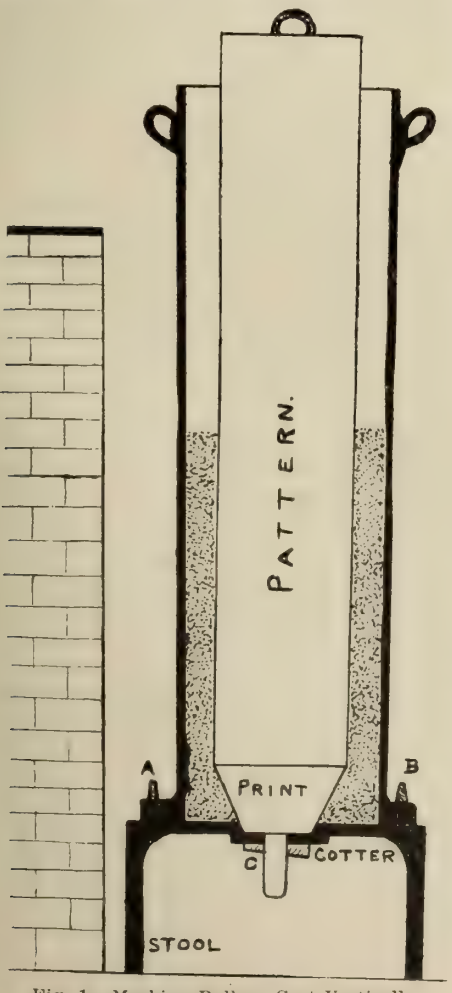


Fig. 1.—Machine Rollers Cast Vertically.

MACHINE ROLLERS CAST VERTICALLY.

By John H. Eastham, Montreal.

DURING the recent slump in the Lancashire cotton trade, local makers of machinery had great difficulty in obtaining sufficient orders to keep their works running three-quarter time. One firm of long standing suffered so severely through keen competition and the copy of their patent without actual infringement, that a reduction in the cost of production became absolutely necessary

Vertical Method Detail.

To this end, amongst other items, a roller job came under notice. With each machine sold, one 9 inch and one 7 inch diameter roller were required, of varying lengths, according to size of machine ordered. These had for years been moulded horizontally in ordinary pipe flasks, blackwashed and dried in the usual way, and cast vertically in a special pit for the purpose. The foreman decided to mould the rollers vertically in the above mentioned pit, for the reason that the clumsy pipe boxes required the crane too often.

In place of the old half block patterns on which both cope and drag parts were formerly rammed, solid wooden patterns were turned and provided with a staple for withdrawal from the sand. At the lower end a taper print was provided to guarantee the cores being placed in correct position as shown in Fig. 1. Casings cast in halves, and perforated at intervals with $\frac{3}{4}$ inch holes for vents, were made, in two widths and bolted together, to accommodate each separate size roller. About 3 inches ramming room was allowed all round the pattern. Cast iron stools, to serve as bases for casings and patterns, of sufficient height from pit floor to facilitate fastening patterns in place while ramming, and cores whilst pouring, were also provided, as shown in sketches I and II respectively. Each mould after being finished, and having the stool attached by cotters in guide pins ''a'' and ''b'', was hoisted on a stove car to the vertical position. Less coke was now needed, and less room taken up, by this arrangement than formerly.

By the addition of a little coal dust to the facing sand, blacking was rendered unnecessary, and after drying, each mould was lowered, into the pit, the core adjusted to place, the cotter shown at ''c'', figs. 1 and 2, driven tight, and the job cast as early as convenient. When shaking out, the cotters (not shown), were first removed from guide pins ''a'' and ''b''. The casing and casting were then hoisted from the pit, and emptied on to the foundry floor.

By this method, 40 per cent. of moulding time was saved, and castings true to pattern obtained; the former ugly joint mark, which had broken several valuable tools in the machine shop, being non-existent. The method of gating is shown in sketch of completed mould at fig. 2.

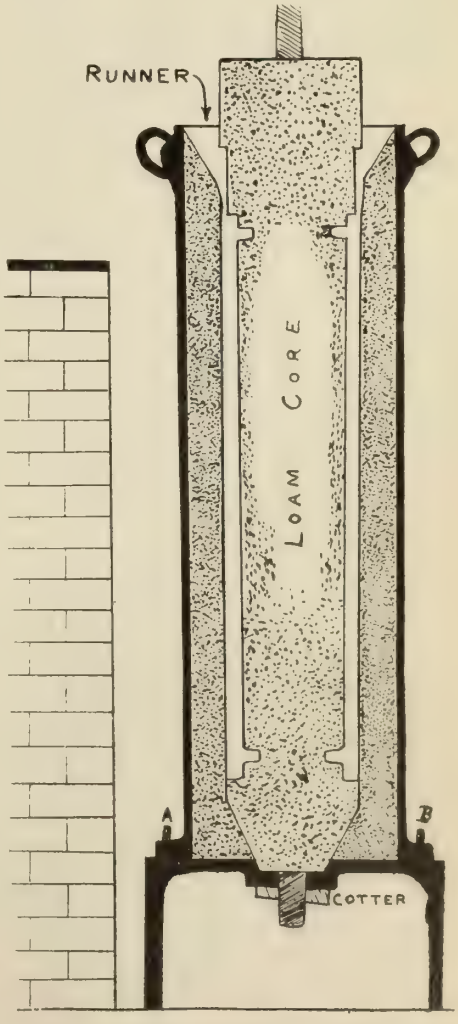


Fig. 2.—Machine Rollers Cast Vertically.

OPEN HEARTH FURNACES FOR SMALL CASTINGS.*

By Walter MacGregor.
Indiana Harbor, Ind.

IN discussing the subject of open hearth furnaces for the production of steel for small castings, I will confine my remarks to fuel oil furnaces, as operating with this fuel when the furnace is properly designed, the melter will have fewer difficulties to contend with.

Turning for a moment to the steam engineering profession, we see that the engineers in well conducted power plants are giving their greatest attention to the problems of combustion, and in the case of plants already in operation, experimenting to find a grade of fuel best suited to their type of furnaces. It is a well understood fact among these engineers, that the design of a furnace, to get the best efficiency from the fuel, depends entirely upon the nature of the fuel to be burned. Obviously, as we are to deal in high temperatures, we have, therefore, to pick out a fuel of heat value, and design our furnace to suit its combustion. In order to get the highest heat, our furnace body should be of such proportions, that we can burn the necessary amount of fuel, in the smallest possible space, and in order to burn a large amount of combustible in a small space, a short flame is necessary.

Short Flame Factors.

The factors governing the short flame, according to the fuel experts of the United States Navy, are :

First—A pure carbon fuel.

Second—Initial heating of the air which furnishes the oxygen for combustion.

Third—Intimate mixture of the oxygen with the fuel, or diffusion.

Fourth—Large surface of the fuel presented for impact of this oxygen.

The first factor, the nature of the fuel, is settled for us, because we have decided upon fuel oil, whose probable analysis is as follows :

C.—83.26 per cent.
H.—12.41 per cent.
S.— .50 per cent.
O.— 3.83 per cent.

With a specific gravity at 60 F. of .926.

The heat value of this fuel, according to Du Long's formulae, would be 19481 B.T.U. per pound. From this analysis we can easily compute the quantity of air required for combustion, and the products of combustion for any amount of fuel burned.

Open Hearth Furnace Requirements.

As a representative size of small open hearth furnace, we will choose five-ton as an example, and discuss the conditions that will determine the proper furnace proportions. We are to melt and reduce five tons of metal, and the time of charging one heat, till the time of charging that following, we will assume as four hours. As the oil consumed varies much in different furnaces, we will assume an average fuel consumption, say forty-eight gallons of oil per ton of steel melted in this given time, or one gallon per minute. Assuming twelve pounds of air required for burning one pound of carbon, and thirty-four and seventy-eight hundredths pounds of air required for burning one pound of hydrogen, we have from the analysis of the fuel :

9.9912 lbs. of air required to burn the total Carbon in fuel.
4.2161 lbs. of air required to burn the total Hydrogen in fuel.

14.2073
.16 Correction of am't for Oxygen in fuel.

14.0473 lbs. air required for complete combustion of 1 lb. of liquid fuel.

With fuel oil of 7.72 lbs. per gallon we have 14.047x7.72=108.37 lbs. air required per gallon of oil.

With air at 13.14 cu. ft. per lb. we have 108.37x13.14=1424.11 cu. ft. air required to burn one gallon of fuel oil.

Hence, to burn one gallon, we must admit theoretically 1,424 cubic feet of air per minute into the furnace. To this we must add the amount of air required in reducing the carbon and silicon in the metal. Ten thousand pounds charge, of which 12½ per cent. is pig iron with about 2½ per cent. carbon, and the rest steel scrap and billets of about .30 per cent. carbon, require reducing to about .18 carbon at the time of tapping. From this we get the total carbon contents of the bath as 56.5 pounds, to be reduced to 18 pounds, or 56.6—18=38.5 pounds of carbon to be burned out in about two hours of reducing the charge. As before, 157.6 cubic feet of air are required to burn 1 pound of carbon, therefore we have $157.6 \times 38.5 = 6{,}070$ cubic feet of air required in two hours, or 50 cubic feet per minute. All of this passes off with the products of combustion. In the same way we can determine the amount of air required in eliminating the silicon, and which will run about 42 cubic feet per minute. A certain amount of oxygen is also taken up by the manganese, but this is so small as to be neglected.

With the total theoretical amount of air required, $1{,}424 + 50 + 42 = 1{,}512$ cubic feet per minute, we are in a position to determine the proper furnace proportions, with due regard to the second circumstance in producing the short flame : "initial heating of the air." The volume of air is figured at a temperature of 72 degrees F., which will be about the temperature of air entering our valve. The increase in volume of air at different points along its travel, due to its increase in temperature, must be the governing factor in designing the ports, flue openings, etc., and as the volume of this air increases in direct ratio to the absolute temperature, it follows that the volume occupied at any point may be computed, when the temperature at that point is known.

The air valve, due to the reversing feature of the furnace, should be figured rather to accommodate the products of combustion than the entering air, as these are at a higher temperature, and will, therefore, require a greater area of flue. The temperature of the valve is a vital point in the problem of design, for any heat beyond this point toward the stack is lost as far as the furnace is directly concerned, and can only be used in the field of economizers. In determining the size of the valve we will first have to determine the velocity of the products of combustion through the valve, due to the draft of the stack. This then gives as our starting point, the design of the stack and which we would more naturally consider our finishing point.

Stack Design.

A number of eminent authorities on chimney design have chosen 600 degrees F., as the most economical stack temperature, and Rankine has spent considerable time in trying to prove it in his work on "Steam Engines." I have never seen an open hearth stack with that low temperature, and will, therefore, base my calculation on a temperature of 1,000 degrees F., because more nearly current practice. In my experience with small furnaces, I find that the most satisfactory stack draft to be maintained, is about one inch of water. This is a function of the height of the stack, and its difference in temperature inside and outside. With this difference in temperature and a draft of one inch of water, we get a stack 110 feet high, hence we will assume this as the minimum height to be desired. The velocity of gas, due to the pressure head for this height of stack and temperature, and allowing a 25 per cent. friction factor, is rather less than fifteen feet per second, a velocity recommended by a number of authorities as good practice.

We have based our calculation, so far, on the theoretical amount of air required for combustion, but will design our stack and flues, as in the case of power plant design, for an excess capacity of one hundred per cent., which would be 3,000 cubic feet of gas per minute, or fifty cubic feet per second. This, divided by the velocity of fifteen feet per second, would give a sectional area of stack of 3 1-3 feet, or a trifle over 2 feet diameter. We will assume 27 inches diameter of stack as best suited to this furnace, and plenty large enough to permit of any crowding. The size of the valve and flues leading to the valve

*Paper read at the American Foundrymen's Convention, Pittsburg, May, 1911.

from the checker chambers will be the same.

Checker Chambers Design.

The second factor governing the short flames, "the initial heating of the air," spoken of before, is introduced by means of the reversing feature of the furnace, through the checker chambers, and these chambers should be so designed as to slow up the travel of the products of combustion, in order that they may give up the major part of their heat to the checker brick, or that part of the heat which is not required to produce the stack draft. The cubical contents of these chambers should not be less than 75 cubic feet per ton of steel melted per heat, and preferably in the neighborhood of 100 cubic feet per ton. These chambers should be located behind the furnace and not immediately under the furnace. This point is quite as important in small furnaces as in large ones, as they operate at a higher temperature, and we should get the benefit of a good circulation of outside air, under the hearth of the furnace. These chambers should be long and narrow, or deep, in oil burning furnaces, giving a very long travel to the products of combustion, before they reach the valve, as on account of the highly volatile nature of the fuel and the slowness with which many of the hydrocarbons mix with oxygen, a great deal of the fuel will be out in the stack before it has undergone complete combustion.

Gas Analysis.

The methods of gas analysis, as applied to steam boiler practice, will show some very interesting relations in this regard. In a five-ton furnace which I have been operating, a flue gas analysis will show the following :

	CO	CO	O
At the rear of the checker chambers 24 ft. back of the centre line of furnace	6.4%	3.1%	.2%
In the air valve 9 ft. further back	8.8%	.3%	8.0%
In the stack 16 ft. further back	9.4%	.3%	9. %

With a decrease in temperature between the first and last point from 1,750 degrees F. in the rear of the chambers to 930 degrees F. in the stack.

In case all the fuel were burned before it reached the stack, the sum of the oxygen components of the flue gas would be 21 per cent., as there is 21 per cent. by volume of oxygen in all the air admitted to the furnace, the volume of the carbon element being so small as to be considered zero. As a matter of fact, however, the sum of the oxygen components at the valve is only 17.1 per cent., and even out of the stack it is only 18.7 per cent., which shows that there is some form of hydrocarbon gas occupying the other 4 per cent. and which is getting past the valve unburned, and being wasted out in the stack. This, I think, shows very conclusively, the necessity of having long chambers and flues in oil burning furnaces, to insure complete combustion of the gaseous fuel before reaching the reversing valve.

The above figures are based on atomizing the fuel with compressed air instead of with steam, because with steam, the hydrocarbons are slower in taking up oxygen, and a gas analysis at the valve will show a higher percentage of hydrocarbon gas unburned at the valve, and a corresponding increase in stack temperature. A sample of gas at the base of the stack, when steam was used for atomizing purposes, showed the following analysis : CO_2, 7.5 per cent. ; CO, .4 per cent., and oxygen, 9.5 per cent.

Oxygen and Fuel Mixture.

The third condition governing the short flame, "intimate mixture of oxygen with the fuel or diffusion," bears directly on the size and arrangements of the air ports and the furnace body. The size of the ports depends upon the size of the reversing valve, or vice versa, and the relation between the two is in direct ratio to the absolute temperature at the two points, these being 1,490 degrees F. at the valve, and 2,800 degrees F. at the ports, or a ratio of 1 to 2. The ports, therefore, should have an area of twice the area of the reversing valve, which will give us a total port area at one end of the furnace of about seven feet. These ports should be carried the full width of the furnace, to prevent any short circuit of air through the furnace body, as the travel of gas through the furnace body should have the same velocity at all points to get the proper diffusion. These air ports should come well up above the hole in the monkey wall, through which the oil burner enters the furnace, so that the air must come down on top of the flame rather than underneath it. This is a very important factor in designing a hot working furnace.

The space to be allowed for hearth in small furnaces should not be under ten square feet per ton of charge, and then, too, the shape should approach more nearly a square than the oblong forms in general use, as this tends to give a better effect to the radiation of the walls and roof Then, by widening the furnace, we lessen the cutting action of the flame on the side walls and keep down repair bills.

As to the length of the furnace body, this should be governed by the length of the oil flame, for the hottest part of the flame should be about the center of the furnace. I have not been able to get a flame that was intense enough to melt down a charge of metal any less than about eight feet from the tip of the burner to the hottest part of the flame, and as the tip of the burner should stick clear through the monkey wall, which will extend at least 9 inches beyond the ports of the furnace, we will get as a minimum furnace length, twice the length of the flame as already mentioned, plus twice the width of the ports, plus twice the thickness of the end walls, and plus twice the 9-inch extension of the monkey wall beyond the ports, or a total of about 22 feet.

Oil Burners and Antomizing Agents.

The fourth circumstance governing the short flame, "large surface of fuel presented for impact of oxygen," is a matter of oil burners and atomizing agents, and has furnished inspiration to thousands of inventors—all to very little purpose. The matter of atomizing this fuel oil is one of overcoming the surface tension of the oil and breaking it up into very fine particles, so that it will present greater surface for contact with the oxygen. The two methods in use, superheated steam and compressed air, give a mechanical efficiency so small that you can barely find it at all.

There is a great deal of discussion at the present time on the needless waste of compressed air for atomizing purposes when superheated steam will answer, but in the small casting business, one of the main difficulties is getting the metal hot enough to run the thin sections in the molds, and since by its very nature, compressed air, while atomizing the oil, furnishes at the same time oxygen for combustion, and that too very intimately mixed with the oil, it is quite evident that by using air we get quicker combustion, a shorter flame and a somewhat hotter furnace.

In conclusion, I will say that in operating a furnace designed along these lines, it will not be a difficult matter to get out six five-ton heats in 24 hours, and still have the metal hot enough to pour many castings weighing a fraction of a pound each. With a five-ton heat it is not uncommon to pour as high as 17 molds, consuming about 50 minutes in pouring. The metal must, therefore, be extremely hot at the time of tapping the heat.

GYPSUM IN NOVA SCOTIA.

In no other territory in the world, it is asserted, are there such vast, varied, and valuable deposits of gypsum as in Nova Scotia. The exposures show beds of from a few feet to hundreds of feet in thickness, ranging in color from gray to snow white, and frequently of the best quality. Some of the deposits have been worked for nearly a century, but so far only two mills have been established for the manufacture of gypsum products. The production of gypsum rose from 300,000 tons in 1908 to 322,974 tons in 1910, practically all being sent abroad.

EXHAUST FAN RECORD.

The Canadian Buffalo Forge Co., Ltd., Montreal, has perfected a slow speed multi-blade exhaust fan which has proven exceptionally economical in power consumption.

The high efficiency is attributed to the multi-blade design of the fan wheel, and to its proportions, which give maximum efficiency at speeds averaging fully 30 per cent. below the normal for exhaust fans. Slow speed is an important feature, as it reduces power consumption, minimizes wear and cost of upkeep, and lengthens the life of the fan.

The applications of these fans, are almost as numerous as those of standard design; sawdust, shavings, spent tan bark, refuse from abrasive operations, grain, wool, cotton, dust, smoke, gases etc., being easily and economically handled.

The fans are made single or double, in sizes from 30 up to 80 inches in diameter, and for pressures from one to six ounces. Like the "Buffalo" standard exhaust fans, they are made with reversible housing. Structurally, they embody all the features of the most advanced fan practice.

Personal

Mr. Bruce Harman, for many years a prominent member of the staff of the Linde British Refrigerator Company, London, England, was recently appointed manager for that company in Canada, and has taken up his new duties in the company's offices, 628-629 Coristine Building, Montreal. The company has been doing business in this country for over fifteen years and its operations are well known in all parts of the Dominion. Confidence has been shown in Mr. Harman's ability, by placing him in charge of this large and important territory.

Mr. A. W. Farnsworth, consulting engineer, of London, England, visited London, Ont., last week in the interests of English capitalists, who are looking for a location for the erection of a $5,000,000 steel plant. Mr. Farnsworth is visiting all the principal cities in Canada.

The death of Samuel O. Greening, president of the B. Greening Wire Co., of Hamilton, Ont., occurred in that city Aug. 31, in his sixty-fourth year. He had been ill for about a year, and his death had for some time been expected. Mr. Greening was born in Manchester, Eng., and came to Canada when quite young. Upon the death of his father, in 1877, he became head of the business, which, in 1899, was incorporated under its present style, and which, under his management, became one of the leading industries of Hamilton. He was a director of the Dominion Power and Transmission Co., and took an active part in the commercial and social life of Hamilton.

RECENT LEGAL DECISIONS.

Damages to the extent of $1,800 were obtained by Francis William Greene, from the Canada Foundry Co.

Greene had entered a suit against the company for $10,000 damages for injuries received on October 10, 1910, when an explosion occurred which threw molten pitch over him. As a result he was confined in a hospital for five months and is still under the care of a physician.

When the case came up before Mr Justice Middleton in the Jury Assizes, it was pointed out that the notice required by law, to be given within three months of the accident, that action was to be taken against them, was not given the defendants.

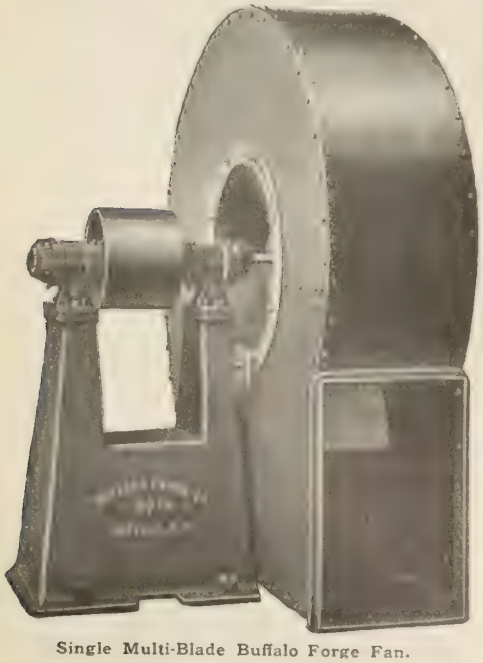
Upon Judge Middleton ruling that it was necessary that it be proved that defendants' case was not prejudiced by this lack of notice, a consultation took place between the lawyers, which resulted in the case being settled out of court.

William Fleming, who was injured in August, 1910, owing to a fuse blowing-out in a street car, upon which he was riding, was awarded $1,200 damages against the Toronto Street Railway Company, by Mr. Justice Middleton in the Assize Court. The amount asked by Fleming was $5,000.

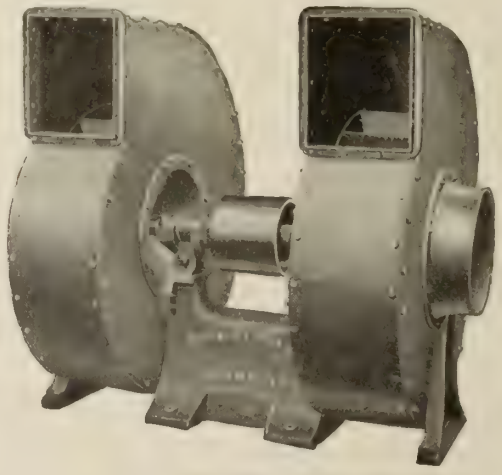
From a paper dealing with the composition and treatment of iron and steel, it is noted that the centre of a casting is always coarser grained and weaker than the surface. Removing the skin of a casting reduces its strength per unit of cross-section. Bars cast horizontally are more uniform in strength and size than those cast vertically.

Sickness and invalidity insurance by co-operation between employer and worker is a subject to which too much attention cannot be given. Many American as well as European employers have established model institutions for complete social relief for their workers, and in nearly all cases such institutions have proved successful, not only from a humanitarian standpoint, but from a business standpoint.

The Robb Engineering Co., South Framingham, Mass., and Amherst, Nova Scotia, are building at the latter plant, two large rolling mill engines of 2,500 h.p. each. These engines, which are the first rolling mill engines to be built in Canada, are for the Dominion Iron and Steel Company



Single Multi-Blade Buffalo Forge Fan.



Double Multi-Blade Buffalo Forge Fan.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

IN this month's lesson we will consider the subject of screw threads. This should prove instructive both to the apprentice and also to the full-fledged machinist. The latter may be perfectly familiar with the method of producing a screw thread on an engine lathe, and yet find himself somewhat at sea when it comes to a question of making a correct drawing of such a thread.

Various Forms of Thread.

For the benefit of the apprentice we have prepared Fig. 1, which shows some of the most commonly used forms of screw thread. The pitch, p, of a screw is the distance from a point in one thread to the corresponding point in the next thread, measured parallel to the axis of the screw; and defines the distance the screw will advance into its nut in one complete revolution. The pitch is usually spoken of as being so many threads per inch; thus, 8 per inch means that there are eight threads and eight spaces per inch of length. It is also expressed as a pitch of $\frac{1}{8}$ inch.

The Whitworth thread, Fig. 1, is the standard form of triangular thread used by engineers in Great Britain and most other parts of the Empire. In it, the sides of thread are inclined to each other at an angle of 55 degrees; the depth, d, if the thread came sharp to the top and bottom, as shown by the dotted lines, would be equal to .96 p, where p is the pitch. The actual depth is only two-thirds of this, however, one sixth being rounded off top and bottom, as shown. To draw this thread, first set down a horizontal line A.B. and mark on it the pitch for the required number of threads. From the points thus obtained drop perpendicular lines as shown, and from these same points draw lines at 27½ degrees to these perpendiculars. Where these angular lines meet, draw another horizontal line C.D. The vertical distance between A.B. and C.D. is the theoretical depth, d, of the thread Divide this depth, d, into six equal spaces, and draw a horizontal line through the first division from the top and the first from the bottom. These two lines give us the actual depth of the thread, as shown rounded off top and bottom.

The Sellers thread is the standard form of triangular thread in the United States. Its sides are inclined at an angle of 60 degrees and the theoretical depth, d, is consequently equal to the pitch. An amount equal to $\frac{1}{8}$ d is cut off at the top and bottom, and left flat.

Another thread, frequently met with, is the common Vee thread. This is exactly the same as the Sellers thread would be, if the flattening at top and bottom were omitted. It is impossible to produce such a thread with scientific accuracy, besides the sharp points of course soon become worn and are easily damaged. Most authorities are urging the abandonment of the Vee thread, and it is to be hoped that it will soon be as extinct as the dodo.

The types of thread so far discussed all have ample strength, but their frictional resistance is very high. In order to reduce friction, the square thread is often used. In this type, the thickness and depth of the thread are equal to half the pitch, and the number of threads per inch is generally half the number required for a triangular threaded screw of equal diameter. Square threads are often used for transmitting motion, as in planing machines, lathes, etc. This form of thread is not as strong as the triangular type, and where the pressure to be transmitted is in one direction only, the buttress thread is more often adopted, the pressure in its case acting on the perpendicular side of the thread, as indicated by the arrow. This type is a combination of the triangular and the square threads, and has the strength of the former and the lower frictional resistance of the latter. Fig. 1 clearly shows its construction, although as it is not a standardized thread, the amount cut off top and bottom may vary in different shops. Sometimes this thread is rounded off instead of being left flat as shown in the cut.

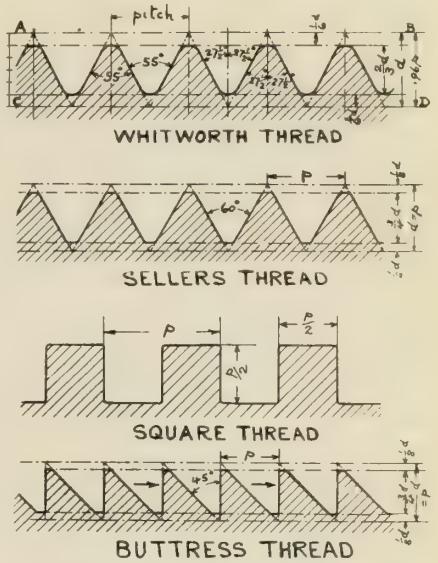


Fig. 1.—Drawing and Sketching.

Drawing a Helical Curve.

The edge of the thread in passing round the body of the bolt forms a helical curve, and the method of drawing this curve as it appears in a square threaded screw is shown in Fig. 2. Lay down the horizontal centre line, and at equal distances on either side of it draw two horizontal lines to represent the diameter of the screw over the threads. Set off the pitch along these lines and make the width of the thread equal to half the pitch. Draw horizontal lines to represent the depth of the thread, which is also equal to half the pitch.

It will be well to pencil all lines rather lightly at first, as parts of them will have to be erased later. Mark off the square threads, remembering that in a single threaded screw, such as we are now drawing, the threads at the

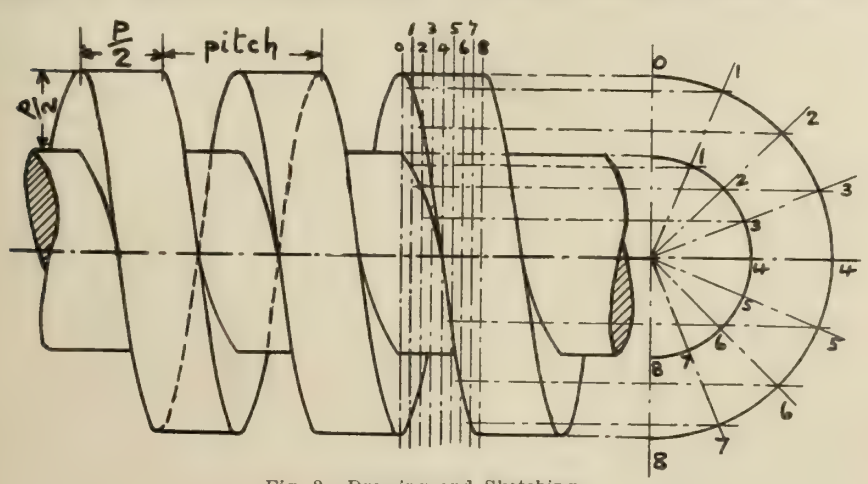


Fig. 2.—Drawing and Sketching.

* Eighth of a series of an instruction course.

top come opposite the spaces at the bottom. This is seen clearly in Fig. 3, which shows a nut for the screw shown in Fig. 2, but drawn to a rather smaller scale.

Next draw a half end view as shown to the right in Fig. 2. The smaller semi-circle shows the diameter of the screw at the bottom of the thread, while the larger is the diameter over the threads. Divide these semi-circles into any convenient even number of equal parts, say eight. Then divide half the pitch into the same number of equal parts, beginning at the corner of a thread, and drop perpendiculars through each point.

For a right hand thread, number these vertical lines as shown:—for a left hand thread, the order of the numbers will be reversed, that is, 8 will be on the left and 0 on the right. Next number the division points on the two semi-circles as shown in the cut, the order remaining thus, whether for a right hand or a left hand thread.

Points on the helical curve are obtained by the intersection of each vertical line with its corresponding horizontal line, the larger semi-circle giving points at the top of the thread and the smaller giving points at the root. The points thus obtained must be neatly joined up by a curve, in fact neatness and accuracy throughout are of the greatest importance, if the student wishes to make a drawing in which he can legitimately take some pride, when completed.

When one thread has been drawn by the above method of projection, it is best to make two templets of light wood or stiff cardboard. One should be cut to fit the curve at the top of the thread and the other to fit the curve of the root. By the aid of these templets the remaining threads may be quickly drawn. A little consideration will make clear the reason for the construction shown in Fig. 2. It is obvious that while a point in the screw passes through one of the divisions of the circumference, it will also move parallel to the axis of the screw, a like proportion of the pitch.

Fig. 3 shows a nut for a right handed square threaded screw. It is shown in section, and at first glance, the threads appear to be opposite hand to the right hand screw, Fig. 2. However, this is not really so. Remember that the nut is in section and note in Fig. 2 that the dotted curves in the screw are inclined the opposite way to those shown in full lines.

The curves of the thread in the nut are obtained by a similar method to that employed in Fig. 2. We have not shown the construction lines so fully, being of opinion that the student will derive more benefit from the exercise, if he studies out the matter for himself

Square threaded screws of coarse pitch are comparatively weak owing to the great depth of the thread, which reduces the body diameter considerably. The trouble may be overcome by sub-dividing the pitch into two, three, or more threads, each of which is ½, 1-3, etc., of the pitch in width and depth. This subject will be briefly treated at the beginning of our next lesson.

Owing to lack of space the final part of the September lesson was omitted. Referring to page 257 of the September issue, Fig. 4 shows a cast-iron chain barrel or drum for a jib crane. This is a good example of the usefulness of sectional views, because the longitudinal section shown gives all the information required by a pattern-maker of average intelligence. It will be a good exercise for the student to complete the drawing by the addition of an outside elevation and two end views.

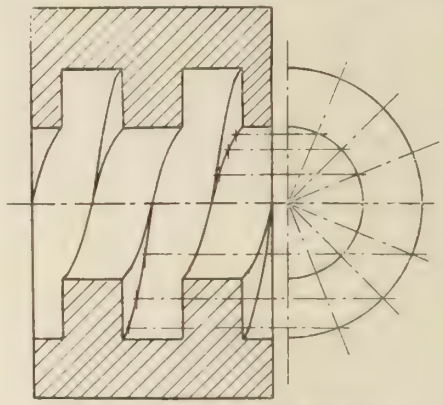


Fig. 3. Drawing and Sketching.

Student Exercises.

The long evenings are again here, and we propose setting a few exercises at the end of each lesson, which all students should endeavor to complete before the following issue appears.

1. Draw accurately a full size section of a Sellers thread bolt 4 inches dia., and 1¼ inches pitch.

2. Draw a square threaded screw 5 inches dia., 2 inches pitch. Show four or five threads, two being in section.

3. Draw a buttress thread in section. Show four threads; screw to be 3 inches dia., by 1 inch pitch. One sixth of the depth is to be cut off flat, top and bottom

THE NEW POLSON DRYDOCK.

THE new Floating Dry Dock now building at the Polson Iron Works, Limited, Toronto, Ont., is of the following dimensions:

Length	..600	feet.
Length over outrigger	642	"
Breadth over all	100	"
Breadth at deck inside	80	"
Breadth at top inside	84	"
Depth over all	35	"
Depth to dock deck	8	"
Lifting capacity	..9,000	tons.

At present, only two sections of 150 ×100 feet are being built, making an overall length of 336 feet, with a lifting capacity of 4,500 tons, and easily able to accommodate any vessel trading on Lake Ontario. At a future date, when larger vessels are expected to be on these waters, a 300 feet section will be built and added to the dock, making a total length of 642 feet, with a lifting capacity of 9,000 tons.

Constructional Detail-Bulkheads.

The dry dock is of U-shape section, each 150 feet length, being divided transversely by two watertight bulkheads, spaced 50 feet apart. These bulkheads are fitted intercostally between the three longitudinal bulkheads which run continuously from end to end. That on the longitudinal centre line is not intended to be watertight. Those at the side, located 20 feet on each side of the longitudinal centre line, are of watertight construction. These bulkheads consist of ⅜-inch plating, 5×3×⅜-inch vertical stiffeners spaced 30 inches apart, 5×3×⅜-inch horizontal stiffeners spaced about 7 feet apart, and shell and deck angles of 3½×3½×⅜-inch.

Constructional Detail—Framing.

The framing consists of both longitudinal and transverse systems, the former being carried out between the wing bulkheads in the centre, and the latter, outside the wing bulkheads and on the walls. Solid floors are fitted transversely every 10 feet between the longitudinal bulkheads, and consist of ⅜-inch plating, with connecting angles of 3×3×⅜-inch and vertical stiffeners of 5×3×⅜-inch spaced 30 inches apart. Between these solid floors, are fitted the longitudinal frames of 6×3½×⅜-inch on the bottom and 12×25 lb. channel at the top. The former are fitted intercostally between the solid floors, while the latter run continuously from bulkhead to bulkhead. This longitudinal system of framing is completed by a continuous series of lattice work of 4×4×⅜-inch angles, with ⅜-inch cross ties and brackets securely connecting them to frames and vertical stiffeners.

The longitudinal framing summed up, comprises a non-watertight centre bulkhead, two side wing watertight bulkheads, and fourteen rows of frames and bracings. The transverse framing consists of a series of lattice work frames opposite every solid floor, of 6×3½×⅜ angle frames, ⅜-inch brackets and 4×4×⅜-inch bracings. The side frames of outer and inner walls extend from top to bottom continuously, and have beams securely bracketed to them about every 7 feet. Intermediate frames, fitted between each solid floor, spaced 30 inches apart, and extending from wing bulkhead to top, are of 6×3½×⅜-inch angles with ⅜-inch brackets connecting beams and stanchions.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

IMPORTANT LIGHTING CONSIDERATIONS.

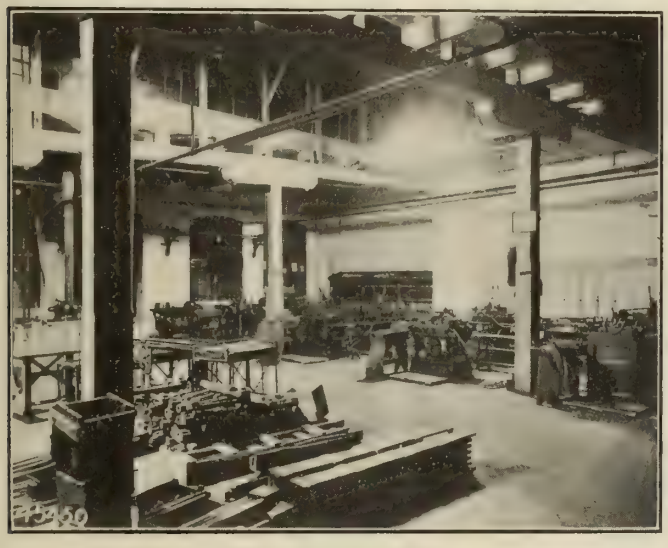
By F. B. Allen

IT may be stated that the success of any institution depends upon the efficiency of its individual composition. This is evident, as all work planned or produced is the result of human thought. Every institution has four departments: the Finance, Executive, Producing and Sales. Each one of these departments is of equal importance, yet the greatest money value is represented in the Producing Department. Thus, a highly efficient Sales Department may be employed at less price than a Producing Department. It is, therefore, of extreme importance that the individuals of this latter, work at highest efficiency. Any considerations, tending toward the realization of this efficiency, should be of paramount interest.

Below is a diagram of shop conditions relative to Producing Department efficiency :

Employes' Efficiency.

An employee's efficiency depends upon two things—ability and willingness to do the work. As far as ability is concerned, it is dependent upon three considerations : firstly—powers of perception, of which in nearly every case sight is of the greatest importance ; secondly—brain, or intellect, to direct ; and lastly—body to perform the work. Willingness to labor depends upon conscious and subconscious will. Consciously, wages are largely influential in producing the will to work ; subconsciously, the realization of fair treatment by employers, and conditions in the factory tending toward health, such as correct illumination, temperature, ventilation, sanitation, etc. It will be noticed that in in both divisions of ability and willingness, light is a strong consideration. If a man cannot perceive or see, he cannot plan or execute. Again, if the illumination is such as to strain his eyes, producing mental fatigue and nervousness, he will unconsciously be unwilling to work. The thorough consideration, therefore, of the qualities of illumination which will produce the desired results toward ability and willingness are of interest.



Important Lighting Considerations.



Important Lighting Considerations.

Below is a diagram of shop conditions relative to Producing Department efficiency :—

Efficiency of Individuals of Producing Department depends on their	Ability to Work	Perception	Sight	Natural Light Artificial Light
			Sound Touch Taste Smell	
		Intellect aided by	Education System Experience	
		Body aided by	Machinery and power to operate same	
		Conscious will Dependent on	Wages (Market price)	
			Treatment	
	Willingness to work	Subconscious will dependent on	Conditions tending toward physical welfare	Correct Light Temperature Ventilation Sanitation

Quality of Illumination.

There are four qualities in illumination which should be considered: first—the correct amount of light, that is, the happy medium between dimness and dazzling brilliancy; second—the lack of glare of high intrinsic brilliancy; third—the lack of flickering; and lastly—the elimination of harmful radiations. Under the correct amount of light we may say that the eye is able to work under a broad range of intensities. Thus, we can often read accurately in moonlight and still do so in dazzling sunlight ; the latter being over a million times the brilliancy of the former. It may be stated, however, that dependent upon the class of work, the eye should be exercised under from $\frac{1}{2}$ foot candle to 15 foot candles. Glare is an extremely harmful characteristic in any illumination. It not only cuts down the ability of the eye to see accurately, but produces eyestrain and nervousness. Flickering is also an extremely deleterious quality.

Its results are about the same as are produced by glare—inefficiency of the eye in working together with eyestrain due to the rapidity with which the eye tries to re-focus under the different intensities. This quality may be brought about in one of two ways. Either the light source varies in intensity, or the light upon a given plane of working is not even. In each case the eye must re-focus very often.

The most effective rays in producing vision are the yellow and green. The rays on either side of these in the natural spectrum are of less practical value, since they require to be much more powerful in order to produce the sense of vision, and hence strain and fatigue the eye to a correspondingly greater extent. The red and heat rays are particularly irritating for this reason, and the different colors also produce well-known mental effects. Thus red is exciting, while blue and violet are depressing. The use of a red flag in bull fights, and the well-known expression "feeling blue," are recognitions of this fact. Yellow gives contentment, while green is restful.



Important Lighting Considerations.

The Mercury Vapor Lamp.

The mercury vapor lamp has qualifications which are extremely advantageous to industrial illumination. It is a scientific fact that the eye will focus more accurately under the green rays produced by this lamp than under a combination of the seven colors of the spectrum. For this reason it is extremely advantageous to employ the light where accurate eye work is required. It is evident for the same reason that the eye can also see more distinctly under lower intensity of illumination with green light than with a combination of the seven colors of the spectrum. The application of this to industrial illuminations results in the ability to entirely eliminate auxiliary lights of small candle power, where ordinarily the illumination from an over-head system would not be sufficient.

The light produced by the mercury vapor lamp, is extremely low in intrinsic brilliancy, the amount of light being produced rather from the area than from the brilliancy of the source. This secures a total absence of glare, not only where the source is directly exposed to the eye, but from polished surfaces. Reflection of glare from polished surfaces is found to be extremely annoying and of as serious a character as the exposing of the direct rays of the lamp. Where these lamps are employed, the system is of an overhead character. The lamps are placed to light a certain number of square feet, and are laid out symmetrically regardless of the placing of the work beneath. This produces a perfectly evenly distributed light on the floor. It may be seen, therefore, that upon a working surface no different intensities of illumination will be found, and, therefore, the eye will not be called upon to re-focus. The source, a tube varying in length with the different types of lamps, is a steady line of light, being in any given period, of exactly the same intensity. The length of the source is a decided advantage, tending towards distribution and the elimination of distinct shadows.

Analysis of Values.

An analysis of the qualities of the mercury vapor lamp, will show that where color values are of little importance, the other qualities of the light are exactly those which are required to produce correct illumination for employees in industrial work. The importance of this cannot and must not be overlooked. For instance, in one of the large silk mills of the east, it is figured by a well-known cost expert that the expense of producing their product at night is 20 per cent. higher than that of producing it in the day time. This may be due to several things, but must be largely attributed to inferior illumination. Had these people in their factory an illumination during the dark hours as good for working purposes as the best daylight, their cost of production during that time, would very evidently be largely decreased. It seems strange that the importance of this consideration has been overlooked, particularly in view of the fact of the extremely low comparative cost of units of illumination and their operation.

Factory Production of Power.

A large modern factory, it may be figured, can produce power at a cost of one cent per kilowatt hour. A mercury vapor lamp can be run five hours at a power expenditure of one kilowatt hour. On an average in industrial lighting one mercury vapor lamp will take care of at least two men. Figure an average cost of 40 cents per hour to employ these two men. This would mean an expense of $3.00 to employ these two men five hours, whereas perfect light for them can be produced for one cent. In other words, if perfect light will save one-half of one per cent. of a man's time, it has paid for its total cost of operation. Not only that, but the value of machinery and factory investment is increased in proportion as the efficiency of the men is increased. Thus, with improved illumination it is not difficult to imagine that 20 machines will do the work that 25 had done heretofore. The value of the given investment has increased 20 per cent., or probably ten times the value of the lighting units to produce this result. These are the important considerations in any lighting installation, and cannot be overlooked. Any system of figuring which does not consider these points is entirely fallacious and can mean but little.

WARNINGS.

The Manchester Steam Users' Association issues the following :

Don't overload the safety valves or tamper with them.

Don't let the water level sink out of sight.

Don't allow the cocks and valves to set fast.

Don't open the steam stop valves hurriedly.

Don't empty the boiler while steam is up.

Don't open manholes before easing safety valves.

Don't raise steam hurriedly.

Don't use unknown scale solvent or compositions.

Machinery Display at the Canadian National Exhibition

The Machinery Displayed at the Recent Annual Canadian National Exhibition in Toronto, Was at Least Up to Its Previous High Standard of Excellence—The Exhibition Was Open From Aug. 26 to Sept 11, During Which Time Over 926,000 People Passed the Turnstiles—The Machinery Hall Proved All Too Small, and a Number of Exhibits Had to Find Accommodation in Tents Outside—Much Advantage Was Taken of the Opportunity by Mechanics, and Numerous Inquiries and Sales Were Reported.

EXHIBITORS.

The Chapman Double Ball Bearing Co., Toronto, showed many examples of their well-known annular ball bearings and double ball thrust bearings. To demonstrate the small amount of power absorbed by these, seven of them were placed upright on the floor in a line, and driven from a countershaft by six "belts" consisting of fine twine, the countershaft itself being driven by a similar belt of twine from the line shaft.

Jones & Glassco, Montreal, showed numerous examples of Renolds' Silent Chain for which they are sole Canadian Agents. This driving chain is well-known to all power users. Among their other exhibits were specimens of the Kenyon patent inter-stranded cotton driving rope, made by Wm. Kenyon & Sons, Ltd., Dukinfield, Manchester, Eng.

D. K. McLean showed their well-known British oak-tanned leather belting, besides steel split pulleys and other mill supplies.

The Dominion Abrasive Wheel Co., New Toronto, had an attractive display of vitrified emery wheels, including a ring wheel 30 inches diameter, 2 inches thick and 6 inches high. All types and sizes were shown from wheels ¾-inch diameter by ¼ inch thick, for internal grinding, up to 30 inches diameter by 3 inches thick.

The Borden-Canadian Co., Toronto, were kept busy demonstrating the Beaver die stocks for threading and cutting pipe. These die stocks have adjustable dies which do not require to be changed for the different sizes of pipe. Thus, the 6-inch die stock will cut all sizes of dies, and moreover, can be operated by one man.

John Millen & Son, Montreal, exhibited Cyclone high speed chain blocks, Wright monkey wrenches, Stover pipe wrenches, a good display of Coventry noiseless chain drives and Hoffman ball bearings.

The Dominion Belting Co., Hamilton, Ont., showed driving and conveyor belts made from their "Maple Leaf" stitched cotton duck.

The General Machinery Co., Traders Bank Bldg., Toronto, showed a 3-H.P. Luitwieler Pump in operation. This pump is of the cam driven, non-pulsating type, the absence of water jar and vibration being very marked. The pump was motor-driven through gears, and was exhibited standing upon four water glasses. The delivery pipe was throttled to represent a head of about 40 pounds, yet no vibration could be seen on the surface of the water in the glasses.

The Canadian Hart Wheels, Hamilton, Ont., showed a large selection of their Beaver brand of razor hones and corundum grinding wheels.

The Boiler Repair and Grate Bar Co., Toronto, were demonstrating their 20th Century shaking and dumping grate bar. They also exhibited Bundy steam traps and other specialties.

The Jas. Morrison Brass Manufacturing Co., Toronto, were located in the Process Building where they had a large booth in which were displayed numerous and varied specimens of the work turned out by them. The exhibit included pressure gauges, counters, injectors, marine engine-room telegraphs, etc.

The Canada Metal Co., Toronto, were located near the south entrance to the Machinery Hall, where they had a good display of their well-known products, including lead joints and plumbers supplies of all kinds, fuse wire, copper ingots, battery zincs, pig lead, spelter, etc. In addition, samples of their many brands of Babbitt were shown, among which the Harris Heavy Pressure occupied a prominent place.

The Dodge Manufacturing Co., Toronto, occupied a large space with their well-known products for power transmission, including split wood pulleys, bearings, hangers, etc.

The Canadian Mathews Gravity Carrier Co., Toronto, had three types of ball-bearing gravity carriers in operation together with an automatic inclinable elevator. Much interest was shown by visitors to this exhibit.

H. W. Petrie, Toronto, are Canadian agents for the Keighley Gas and Oil Engine Co., England and showed three gas engines by that company, all operating on producer gas. The largest was 65 B.H.P.; the other two being 30 and 12 B.H.P. respectively. They also had a comprehensive exhibit of machine tools, including a Lodge and Shipley 14-inch tool-room lathe having double back gears, quick change speed gears, taper turning attachment, and thread-chasing attachment. There was also a 42-inch Cincinnati Bickford radial drill and an Acme turret lathe of 1½ by 9-inch capacity, having power feed to turret automatic chuck and wire feed.

The Canadian H. W. Johns-Manville Co. exhibited their asbestos products, roofing material, fibre conduits for underground wiring, J-M and Red Seal dry batteries, and high temperature cements for furnaces. The booth was lighted throughout by the J-M Linolite system of illumination, which is especially suited for show-cases, shop windows, etc.

The Campbell Gas Engine Co., Halifax, England (Agents, Chambers & Simpson, Bay St., Toronto) installed a 25 H.P. gas engine operating on gas obtained from their suction gas producer. They also exhibited a 13 H.P. coal oil engine, fitted with tube ignition and water injector.

The Canadian Steam Boiler Equipment Co., Toronto, were demonstrating their Cyclone shaking and dumping grate bar and also had exhibits of feed pumps and Economic vacuum valves.

Wm. & J. G. Greey, Toronto, had a large show of flour mill machinery, among which were an improved oat-flaking machine, a dough mixer and adjustable dough divider for cutting up dough into equal portions. The exhibit also included steel conveyor buckets, hand trucks and general mill furnishings.

The Garlock Packing Co., Hamilton, had on hand a full line of their packings under charge of H. G. Fletcher, manager of their Toronto branch.

The Acheson Oildag Co., Sarnia, showed Aquadag and Oildag samples. The former is a cutting compound and the latter a lubricating compound. Graphite in an extremely fine state of sub-division forms the principal constituent of each.

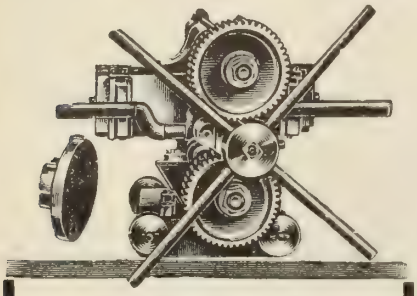
The Canada Machinery Corporation, of Galt, exhibited wood and iron-working machinery. The former consisted of a Fay-Egan glue jointer, a Falls undercut face planer, 16-inch buzz planer with Falls automatic feed for hand planing, and a hollow chisel machine mortiser. The iron working machinery consisted of one 26 by 16-inch engine

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Machine Tool Makers
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lathe with quick change speed gears, one 16 by 8-inch ditto, and one 16-inch crank driven shaping machine.

The Northern Electric Co. had a commanding corner position in the Industrial Building, where they demonstrated their fire alarm apparatus, telephones, etc.

The Ontario Wind Engine and Pump Co., Toronto, were located in a large tent on the grounds, where they had ample space to display their exhibits. They showed Stickney gasoline engines ranging from 3 to 7 H.P. One of the latter was shown in operation not bolted down, but merely resting on two pieces of iron pipe which were free to roll. In addition, the caps from both shaft journal bearings were removed, and the engine ran during each day with little vibration. Windmills, pumps, pitless weigh bridges were also shown.

The General Supply Co., of Canada, had as their largest exhibit a 25-inch engine lathe of the LeBlond type, built by the **London Machine Tool Co., Hamilton, Ont.** One of the chief features of this type lathe is the off-set centres. The centre line of the head and tailstock is set back off the centre line of the bed, so that when work of large diameter is being turned, the thrust on the tool is taken by the bed itself instead of by the overhanging part of the saddle.

The A. R. Williams Co. showed a good assortment of machine tools and specialties. One of the most prominent of their exhibits was a 14-inch tool room lathe by the Hendey Machine Co., Torrington, Conn. The special feature of the lathe is a quick threading attachment for rapid thread cutting. Its saving in time over ordinary methods is accomplished in the means by which the carriage is returned at high speed from the end of the cut to the starting point. This is accomplished by means of the quick return sleeve having a very coarse pitch and multiple thread. Other machines shown included a 36'' radial drill by the American Tool Co., Cincinnati; a Hendey Norton No. 2 universal milling machine, a No. 2 Warner and Swasey turret lathe having a capacity for 1 by 6-inch stock; 18 and 12-inch drill presses by W. F. & J. Barnes; and a 24-inch shaper by the McGregor-Gourlay Co., Galt. A machine attracting much attention on this stand was a No. 20 Sidney Universal Woodworker. This consists of a 16-inch jointer, 32-inch band saw, single spindle one-way shaper, rip and cut-off saw table and boring attachment, combined in one machine. An instalation showing the principle and operation of the Kewanee system of water supply was also on view.

The International Marine Signal Co., Ottawa, engineers and builders of steel and structural iron, exhibited their well-known Wilson's portable flare lights.

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INDUSTRIAL AND CONSTRUCTIONAL NEWS.

FOUNDRY AND MACHINE SHOP.

Weyburn, Sask.—Acton & Montgomery have secured control of the Weyburn Machinery Co. and are conducting a machine shop and garage.

London, Ont.—A large American automobile concern have secured an option on certain property here and will likely decide to locate a plant.

Niagara Falls, Ont.—The Gaso-Electric Motors of New York and Toronto, have been negotiating location for a plant here.

Fort William, Ont.—The Copp Stove Works and the Harvester plant bonus by-laws were passed by the ratepayers.

Lindsay, Ont.—Mr. McComb is promoting a company which is desirous of establishing a malleable iron industry here. They propose spending about $25,000 for equipment and plant.

Medicine Hat, Alta.—Col. G. W. Loper, of Spokane, proposes establishing a smelter here for the treatment of zinc ores of the Slocan district by the recently discovered natural gas

Jessop's Best Tool Steel is yet unexcelled for cutting tools of all kinds, and for general machine-shop use.

Jessop's "Ark" High-speed Steel gives marvellous results —heavy cuts -- at rapid speed; cannot be burned.

The favorite brands with users of good steel.
A large assortment of sizes in stock.
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Manufactured by **WM. JESSOP & SONS, Ltd.** Sheffield, Eng.

Reid Newfoundland Co.
St. John's, Newfoundland

Alex. Woods
138 Murray Street
Montreal, Que.

Chas. L. Bailey
80 Bay St.
Toronto, Ont.

process. This process has been singularly successful in Missouri.

London, Ont.—This city has for some time been under the scrutiny of a million dollar steel concern from England, which proposes establishing in Canada. Chas. Cook, president of the Positive Clutch & Pulley Co., of Toronto, succeeded in interesting them in this country.

St. Thomas, Ont.—Orders have been received here to complete work on the new M.C.R. roundhouse. Sixteen stalls were erected in 1910, and twenty-five more will now be added at a cost of $50,000.

Windsor, Ont.—The Hupp Motor Car Co. are preparing to erect two factory buildings at a cost of $25,000, and will employ about 175 men.

Berlin, Ont.—John Hahn, foreman in the L. E. Shantz foundry, is opening a machine shop here at the rear of the Pearl Laundry.

Windsor, Ont.—The A. E. White Machine Works, of Eau Claire, Wis., will erect a cement factory here next to the Hupp property at a cost of $6,000. They will manufacture saw mill machinery.

Prescott, Ont.—Chas. Plumb is disposing of his machine shop business here and contemplates going West.

London, Ont.—The C.P.R. is spending $65,000 for improvements, such as office building, works, etc.

Welland, Ont.—The Canadian Steel Foundries have acquired additional property here to make room for the extensions to be made in the spring.

North Vancouver, B.C.—McDougal & Jenkins, engineers, are erecting a $7,000 machine shop building here.

Cardston, Alta.—The Folsom Iron Works were overhauled and improved recently.

Vancouver, B.C.—Leave to proceed with the expropriation of large areas in the vicinity of Coquitlam for shops and yards was granted the C.P.R. recently by the Railway Commission.

Fenelon Falls, Ont.—The Art Iron Limited is establishing a $3,000 factory here and will spend about $5,000 installing machinery. The town is granting them concessions.

Orillia, Ont.—The Tudhope-Anderson Co. are erecting an extensive plant here. Among the buildings to be put up this year are a blacksmith shop 80x128 feet, foundry 80x192 feet, cupola room 40x40 feet, wagon shop 80x192 feet, two storeys, and boiler room 40x40 feet. The latter will be equipped with 125 h.p engine and three 110 h.p. boilers. Steam power will be used in the wagon department only—the machine departments will be operated by electric power. All the buildings will be steam heated. Manufacturing in the machinery department will likely be started next month.

Preston, Ont.—The Preston Car & Coach Co. have built an additional erecting shop. This and other improvements have increased the capacity by one-third.

Ottawa, Ont.—The Dominion Bridge & Steel Co., of Montreal, are erecting a large new storehouse in Eastview, for their machinery. It is of steel, and four storeys high.

Fredericton, N.B.—Thos. Myles, St. Marys, has secured the $15,000 contract for a modern machine shop, which the Smith Foundry Co. are erecting. The Smith people were organized to take over the N. B. Foundry business here, lately conducted by Smith Bros. There will be a machine shop, blacksmith shop and pattern department. A feature will be the 30-foot traveling crane, 10 tons capacity, which, as well as all the machinery, will be run by electricity.

Fort William, Ont.—The Canada Iron Corporation has decided to enlarge its plant here to double its present capacity.

Nelson, B.C.—A fire-bug was responsible for the destruction of the Hall Mines smelter here recently. The works are a total loss—$750,000.

Fort William, Ont.—The Universal Motor Truck Co., of Warren, O., will establish a works here. The plant will cost, with the equipment, approximately $350,000.

Welland, Ont.—The John Deere Co. are about to start the erection of their plant here. A large warehouse will be the first.

Preston, Ont.—Clare Bros. & Co. are taking steps to enlarge their molding shop.

London, Ont.—The Empire Mfg. Co. are at present building a smelter house on their premises, where all metal for factory use will be reclaimed, clarified and refined. The metal will be delivered to the foundry in No. 1 quality ingots. The building is about 150 feet by 50 feet, and besides the smelting plant, contains a laboratory where raw and finished material will be carefully analyzed. All washing and grinding will be done in the basement, which will also serve as a stores room. A Rockwell oil furnace will be used, having a capacity of 5,500 pounds per heat, and three to four heats per day will be run.

Stratford, Ont.—The McDonald Mfg. Co., Stratford, Ont., builders of traction engines, threshing machinery, etc., intend to double

12" RAPID BENCH TOOL GRINDER

The busiest machine in the shop. Keeps the tools in fine shape and saves time, all the time. No longer necessary to burn the fingers and draw the temper of good tools on a dry wheel. Moderate price too

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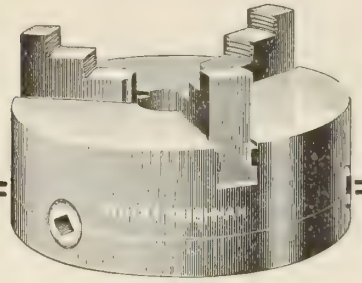
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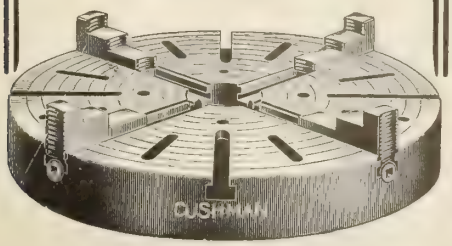
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the capacity of their plant by the addition of new buildings and equipment. About $50,000 will be expended on these improvements.

MUNICIPAL.

Ottawa, Ont.—Three by-laws, aggregating $305,000, for various purposes have been carried by large majorities.

Medicine Hat, Alta.—Five money by-laws for various purposes were ratified by the ratepayers.

Galt, Ont.—The ratepayers have passed a by-law to raise $10,000 for extending and adding to the waterworks system.

Calgary, Alta.—On October 3 the ratepayers will vote on by-laws totaling $856,000 for various civic purposes.

Penticton, B.C.—The ratepayers will shortly vote on money by-laws totaling $24,300 for local improvements.

Yorkton, Sask.—The ratepayers will be called on to authorize the raising of $9,500 for a waterworks system.

Swift Current, Sask.—The ratepayers will vote on several by-laws in the near future, one to raise $44,000 for a waterworks system, and another to raise $10,000 for the instalation of a sewer system and sewage disposal.

North Vancouver, B.C.—The city is contemplating an expenditure of $30,000 for a waterworks system.

Saskatoon, Sask.—The ratepayers have authorized the following by-laws: $75,000 for a water filtration plant; $73,000 for waterworks extensions; $15,000, machinery for board of works and board of health; $45,000 for sewers and water connections, and $225,000 for an intercepting sewer and sewage disposal plant.

High River, Alta.—The by-laws, to establish waterworks and sewerage systems, at a cost of $125,000, and to install new steam heating in the town hall, were carried.

Neepawa, Man.—The ratepayers have approved a by-law to expend $100,000 in the construction of waterworks.

Guelph, Ont.—The light and heat commission are asking for $30,000 to put the gas and electric light plant in A1 condition.

ELECTRICAL.

Lindsay, Ont.—The ratepayers will shortly vote on a by-law to purchase the plant of the Seymour Power Co.

St. Mary's, Ont.—A by-law to raise $15,000 for electric power extensions will be voted on, Oct. 14.

Saskatoon, Sask.—The following by-laws were ratified by the ratepayers: $75,000 for electric light extensions; $80,000 for a new power house, and $135,000 for an electric light and power plant.

Grimsby, Ont.—A by-law to loan $10,000 to the Radiant Electrical Co. was passed by a large majority.

Davidson, Sask.—The town is spending $10,000 for electric light purposes.

Yorkton, Sask.—On October 6 the ratepayers will vote on a by-law to raise $5,100 for electric light purposes.

Moose Jaw, Sask.—The street railway system has been in operation a little over a month now. A significant feature of the system is the type of engines for the power house. They are Diesel oil-burning engines made by an English firm.

GENERAL MANUFACTURING.

St. Thomas, Ont.—T. W. Edwards, of this city, has secured a substantial interest in the Canadian Voting Machine Co., of Niagara Falls. They will erect a small factory later on, the place not yet being decided.

Simcoe, Ont.—The town has voted to erect a $20,000 factory for the Southam Lithographing Co.

Winnipeg, Man.—Work on the buildings and plant of the Alsip Sandstone Brick Co. is practically completed. The cost has been nearly $100,000. The machinery being installed is of a German type and said to be the best in existence.

Bridgeburg, Ont.—The Lautz Co., marble mills, of Buffalo, will erect a $35,000 plant here, and employ about 40 men.

BUILDING NOTES.

Edmonton, Alta.—The city is contemplating the erection of a city hall, to cost about $500,000.

Winnipeg, Man.—The C. P. R. will erect a 14-storey hotel here, "Hotel Selkirk," at a cost of $1,500,000. It will be the last word in modern architecture.

SAW AND PLANING MILLS.

Lennoxville, Ont.—The Standard Box Factory was destroyed by fire recently; the fire started near the boiler room.

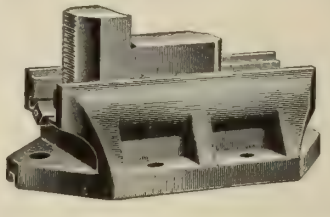
Fort William, Ont.—The saw mill and blacksmith shop at Stanley, owned by T. P. Kelly, were burned out, causing a loss of $7,000.

Goderich, Ont.—The Spanish River Lumber Co. is opening a yard here.

Coboconk, Ont.—The planing mill of the Gull River Lumber Co. was destroyed by fire some time ago. The loss is about $4,000, partly covered by insurance.

Face Plate Jaws

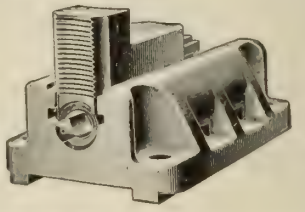
New features include extra large screws, double thrust bearings and special methods of attaching, permitting their use on various-sized face plates.



Ends pointed at an angle of 45 degrees, so that four jaws will fit close together at centre. Sizes 4-in. to 14-in

Boring Mill Jaws

As in the face plate jaws, screws are larger than usual, thrust bearings are double and jaws are wider, heavier and better supported. Made in all steel or with grey iron base as desired.



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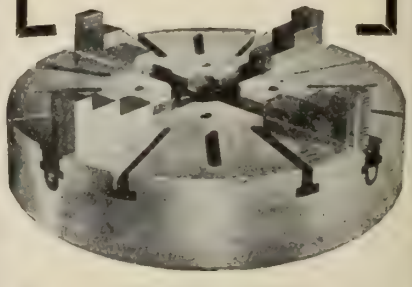
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by only very expensive tools, is made by

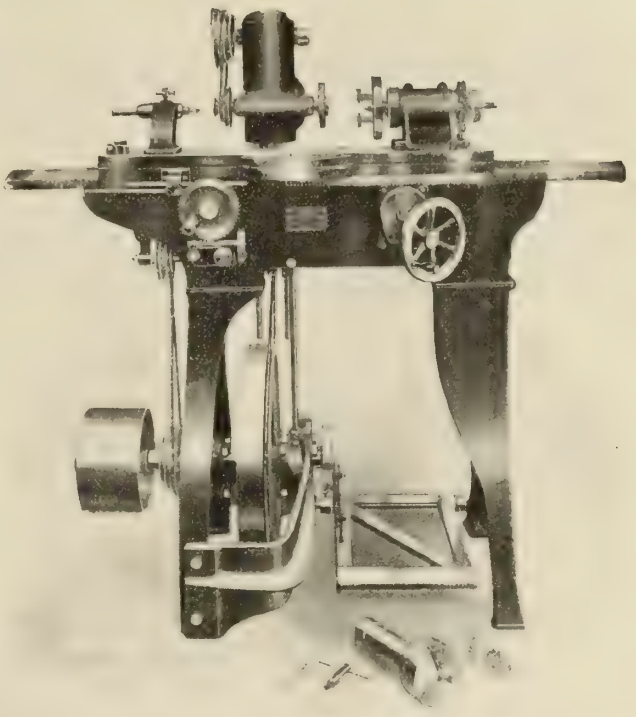
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The Tool, illustrated here, will do

Cutter Grinding
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Internal Grinding

in fact, all the work that the most expensive Universal Grinding Machines will do, so easily that it can be driven by foot power.

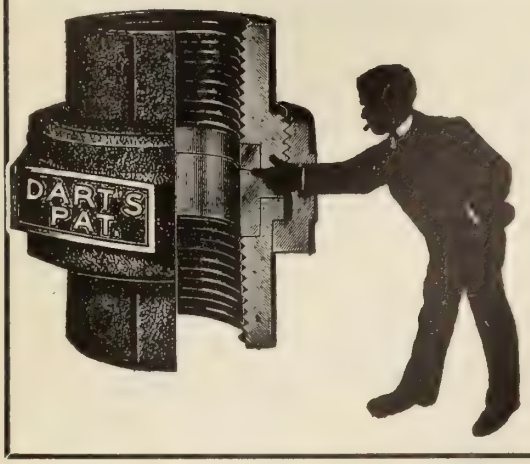


Price $228 at Works in England

This Machine has ball bearings throughout, including the fly wheel, and is of the finest workmanship, material and accuracy. It is supplied so that foot or motor power can be used, as desired.

Length over all - - -	6 ft. 3½ in.
Length between centers - -	1 ft. 5 in.
Center height over table -	3½ in.
Traverse of table - - -	1 ft. 5½ in.
Angular movement of table -	45°
Cross traverse of grinding head	5 ft.
Rise and fall of grinding head	6 in.

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More Likely to be Accurate.

"MORROW" Set and Cap Screws are threaded twice. (Two dies over each screw).

Makes Morrow make uniform.

DON'T ALLOW ANY FIRM TO SELL YOU INFERIOR MAKES.

The JOHN MORROW SCREW, Limited, INGERSOLL

Sarnia, Ont.—The planing mill of the Ludlaw-Ainslee Lumber Co. was burned out, causing a loss of $8,000, partially insured.

Woodstock, Ont.—The plant of the Woodstock Woodworking Co. was badly damaged by fire recently. The boiler and the dry house were destroyed.

Ailsa Craig, Ont.—The saw mill owned by Samuel Gillies was badly wrecked by a severe storm recently.

Shelburne, Ont.—The up-to-date planing mill owned by George Mustard was wiped out recently by a bad fire.

Port Alberni, B.C.—The Canadian Pacific Lumber Co. are erecting a sawmill here, with a capacity of 75,000 feet per day. The plant and buildings will cost $50,000.

TRADE NOTES.

The Grand Trunk Railway Co. has given a contract to the Canadian Car & Foundry Co. for the construction of 1,000 box cars of 60,000 pounds capacity, each, with underframes of steel, and equipped with Westinghouse air brakes and latest appliances. They have also asked tenders for ten 30-foot and ten 40-foot steel underframe flat cars.

The Canada Iron Corporation has issued its report for the fiscal year ending May 31. Although some of the plants are undergoing construction and not up to full working capacity, the earnings were good. Profits for the year were $401,885, and bond interest $175,200, leaving $226,685, subject to some minor changes. The surplus, added to the balance of $149,427 brought forward from the previous year, made $359,807 of undivided profits carried forward. Since the close of the fiscal year, the corporation's position has been improved materially through the acquisition of valuable assets which will not show in the statements until next year.

The Canadian Department of Railways and Canals asks for tenders up to Oct. 16 for 30,000 gross tons of 80-pound steel rails, 1,700 gross tons of spike bars and 5,000 kegs track spikes of 200 pounds per keg, for the Hudson Bay Railway.

The Canadian Locomotive Works, Kingston, Ont., has been awarded a contract by the Grand Trunk Pacific Railway for the construction of 25 large locomotives. The company has now work ahead for a year or more.

The Dennis Wire & Iron Co., London, Ont., are extremely busy at present, and are receiving more orders than they can expeditiously handle. They will extend their plant next spring by the addition of another storey to the north wing of their factory.

Royce Limited, Electrical and Mechanical Engineers, Trafford Park, Manchester, have been awarded an order by the Great Eastern Ry. for 11 electrical capstans of the "Royce" patent free bollard type, and spares for use on the company's wharf and goods yard at Blackwall. The order also comprises ten electrical jib cranes, two electrical hoists and spares.

The Jeffrey Mfg. Co. have closed a contract with the Can. Westinghouse Co. to install a coal conveying plant in their power house at Hamilton. They have recently installed coal-handling machinery at the Can. Light, Heat & Power Co.'s terminal station, Montreal, and in the Grand Trunk Ry.'s new plant at Ottawa. They are at present erecting machinery in the National Transcontinental shops in Winnipeg.

The Coventry Chain Co., Coventry, Eng., has been awarded a gold medal for the excellence of their chains exhibit at the Festival of Empire Exhibition, Crystal Palace, London, England.

The Dominion Bridge Co., Montreal, are constructing four electric cranes for the Canadian Steel Foundries, Limited. All four are for use at the Montreal Steel Works, Longue Pointe, and are of 70 foot span. They are equipped with auxiliary hoists. Two cranes are of 15 ton capacity and two of 20 ton capacity. Dynamic braking controllers are fitted, which render the use of ordinary friction lowering brake unnecessary. They are specially designed for steel foundry service and have all gears enclosed in dust and oiltight cases.

The same company is also building a 10-ton crane for the Canadian Car & Foundry Co., of 72-foot span, and equipped with alternating current motors.

The installation of a 20-ton crane with runway has just been completed at the works of the Dominion Marble Co., Turcot, Montreal. This latter is now handling great blocks of marble in a most satisfactory manner. It also is equipped with dynamic braking controllers. Recent crane shipments include a 10-ton crane of 90 feet span, to Toronto, equipped with alternating current motors, together with a runway 700 feet long, and practically a duplicate to Winnipeg.

Beauchemin & Fils, Limited, Sorel, Que., are making a large edition to their foundry. The new structure is to be 80 by 100 feet and

is to be most modern in every particular. The structure of steel is being erected under the supervision of Mr. J. M. Ryan, formerly of the Montreal Steel Works. The equipment will include two converters of 2½ tons capacity each and electric cranes. The firm manufactures steel castings of all sizes, including a good deal of railway work.

The Advance Machine Works, Montreal, recently supplied the road department of that city with twelve concrete spreaders. They are agents for the Waterloo Cement Machinery Corporation, who make the Polygon Concrete Batch Mixer, fitted with Polygon motion on account of the obliquity of the axis of revolution. A high capacity output is claimed for these machines.

CATALOGUES.

The Bignall & Keeler Manufacturing Co., Edwardsville, Illinois, have forwarded us a catalogue descriptive of their line of improved pipe threading and cutting machines. The firm are specialists in this work, having been engaged in designing and building this class of machinery for more than thirty years. Three types of pipe machines are made, known as the Peerless, the P.D.Q.C., and the Duplex. The die adjusting mechanism is the same on all, and together with all other details, is minutely described and illustrated with numerous excellent half-tones.

The Peerless machine is made in three sizes, having capacities of ¼-inch to 2 inches, ¼-inch to 3 inches, and 1 inch to 4 inches. The dies are closed or opened by a single movement of a lever placed conveniently to the operator's hand, and on all but the smallest size, the drive is through a change speed gear box. The cut-off slide is placed on the back of the head and is provided with a gib for taking up the wear. A speed plate is attached to the gear box, showing how to set the levers for obtaining the correct speed for different sizes of pipe. The change gears are of steel with machine cut teeth and run in an oil bath. Each machine is furnished with a direct connected oil pump, and the bottom of the bed slopes towards the rear, allowing the oil to drain into the back, away from the chips. The Peerless type of machine is equipped with a gripping chuck placed on the front end of the spindle, and having V-shaped jaws. It is universal, and can be quickly adjusted to suit different diameters of pipe.

The P.D.Q.C. machine derives its name from being equipped with Peerless dies and a quick acting chuck. The latter can be operated by a lever while the machine is running, so that when the machine has been set for a certain size of pipe, it need not be stopped until another size is to be threaded. In other respects this type resembles the Peerless in general design.

The Duplex type is intended for the larger sizes of pipe, the heaviest machine having a capacity of from 4 to 12 inches. Two chucks are provided, one at either end of the spindle, to enable large pipes to be very securely gripped for both threading and making up fittings. All three types of machine can be arranged for either a belt or motor drive with silent chain.

The catalogue is printed on faced paper and is so clearly written and illustrated that prospective purchasers cannot fail to get an exact idea of the construction and operation of the various machines.

The Best Manufacturing Co., Pittsburg, Pa., have sent us a copy of their standard tables of Valves, Fittings, Flanges, Pipe, Bends, etc. This folder measures 6½x4 inches and is less than ¼-inch thick, yet it contains a large amount of information. It is printed on cloth to allow of rough handling; the size making it convenient for pocket use.

The Thos. H. Dallett Co., Philadelphia, Pa., have sent us a pamphlet setting forth the principal features of their pneumatic boiler scaler. The tool is a pneumatic hammer of special form, weighing only 27 ounces, and strikes about 3,000 light, uniform blows per minute, cracking the scale without injuring the sheet. Special chisels are used, blunt on the edge, and the air consumption is given as 4 cubic feet per minute.

The Deeming Company, Salem, Ohio., have issued a handsome catalogue of 190 pages, describing their numerous types of power pumps. These include single and double acting triplex pumps for various services, deep well power working heads, artesian well cylinders, rotary and centrifugal pumps, etc. The catalogue is profusely illustrated and is complete in every respect. A copy should be filed by all users and prospective users of this class of machinery.

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Patterns of Every Description.
Satisfaction Guaranteed.
R. POTTS, Toronto
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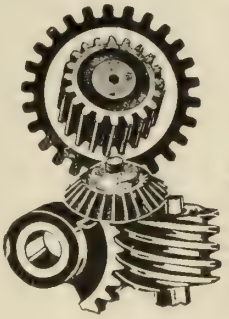
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—for every purpose and the best for each use.
Special styles of all kinds to order.
THE CLEVELAND WIRE SPRING CO.
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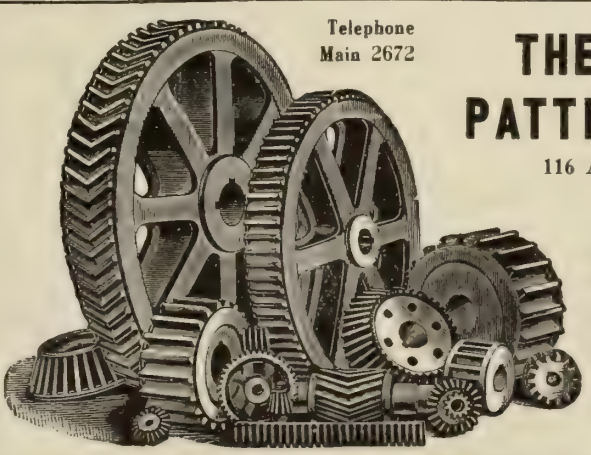
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Difficult Core Work a Specialty
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TWO PLANTS Capacity 8000 TONS
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MACHINE SHOP AND MANUFACTURING MACHINISTS
Shafting, Pulleys, Hangers, Emery Wheel Stands Curling Stones, Boat Winches, Saw Arbors, Lath and Bolter Machines, General Mill Machinery.
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GREY IRON CASTINGS.
All weights up to 6,000 lbs.
We make a specialty of difficult cored work
LET US FIGURE ON YOUR REQUIREMENTS
GALT FOUNDRY CO. GALT, ONT.

C. N. E. POWER EXHIBITS.

The Canadian H. W. Johns-Manville Co. had a large selection of their numerous asbestos products, including packing, roofing material, furnace cements, etc.

Laurie & Lamb, Montreal, exhibited a model of the latest type of refuse destructor, made by Heenan & Froude, Manchester, Eng. This method of disposing of town's refuse is much more widely used in Europe than it is on this continent. Laurie & Lamb have installed two sets in Canada, namely, at Westmount, P.Q., and Vancouver, B.C., and have orders on hand for similar installations at Ottawa, Moose Jaw and Calgary. In the Heenan & Froude destructor the garbage is introduced through a hopper at the top, from whence it falls on to a dead plate at the back of the grate. After remaining there for a few minutes to partially dry, it is raked forward into the trough-shaped grate and thoroughly consumed, the heat being used for raising steam or other purposes. The trough grate has perforated sides, through which forced draught is introduced. The hot gases, before reaching the stack, pass through a regenerator, which raises the air for combustion to a temperature of about 250 degrees Fahrenheit. The average temperature in the furnace is 2,000 degrees, and it is only by maintaining this intense heat that garbage can be successfully dealt with. Approximately one-third of the refuse comes out of the furnace again in the form of a hard clinker, and free of all organic matter. It has a definite commercial value, being largely used in concrete floors and other purposes. Heenan & Froude have introduced a simple mechanical clinker remover, which is generally used in combination with their destructors. The model was shown in an annex to the Public Health Exhibit, and, we fear, was missed by many visitors who would have been interested in it.

Jones & Glassco, Montreal, showed many artistically-arranged examples of the well-known Renold silent chain, for which they are sole Canadian agents. This chain is so well known to power users as to need no further comment. Kenyon's patent inter-stranded cotton driving ropes were also shown, Jones & Glassco being also sole Canadian agents for this specialty.

The Ontario Wind Engine & Pump Co., Toronto, showed a large number of Strickney gasoline engines. One of 7 h.p. rested on two rollers of iron pipe without being bolted down. In addition, it had the covers removed from both journal bearings, and ran all day with very little vibration. The governor can be adjusted while the engine is running, and has a wide range.

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Special Machinery,
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DIES AND TOOLS
POWER PRESSES

For Rapid Production of
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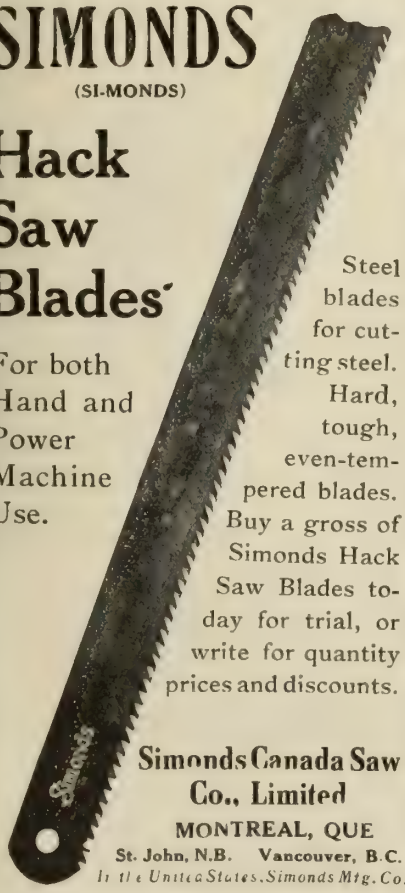
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SIMONDS

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Hack Saw Blades



For both Hand and Power Machine Use.

Steel blades for cutting steel. Hard, tough, even-tempered blades. Buy a gross of Simonds Hack Saw Blades today for trial, or write for quantity prices and discounts.

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along with the right machinery and the skilled mechanics to turn out work that is perfect in every detail at very low prices.

Let us estimate on your blue prints.

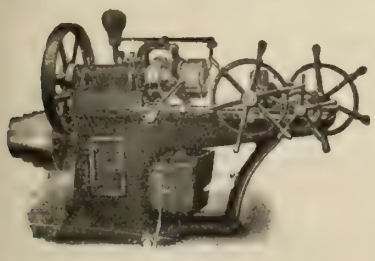
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High Grade Malleable Castings

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and National Wire Nail Machines

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BOLT THREADERS, "WEDGE GRIP," BOLT and
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ROLL THREAD MACHINES, Etc., Etc.

Complete Catalogue "E" upon request.

The National Machinery Co., Tiffin, O., U.S.A.

Canadian Agents: H W PETRIE, Toronto Ont. WILLIAMS & WILSON, Montreal, Que.

John Millen & Son, Montreal, had a large show case display of Coventry noiseless chain for driving purposes. Another prominent feature of their exhibit was a group of Cyclone high-speed chain blocks ranging in capacity from ½ to 40 tons. Hoffman ball bearings, Wright monkey wrenches and Stover pipe wrenches were also on view, the two latter items being very energetically demonstrated.

The Garlock Packing Co. had a full line of their well-known goods on show, also tube scrapers, etc. The booth was in charge of H. G. Fletcher, manager of the Toronto branch.

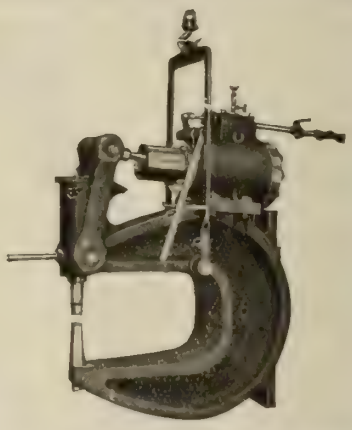
H. W. Petrie, Ltd., exhibited three gas engines made by the Keighley Gas & Oil Engine Co., England. All were operating on suction gas, generated in a producer by the same firm. The largest engine was of 65 B.h.p., the others being 30 B.h.p. and 12 B.h.p., respectively. A high-class display of machine tools and accessories added to the further attractiveness of this exhibit.

The Campbell Gas Engine Co., Halifax, England, showed a 25 B.h.p. gas engine running on suction gas, and a 13 B.h.p. engine operating on coal oil with tube ignition. Chambers & Simpson, Bay Street, Toronto, are Canadian agents for these engines.

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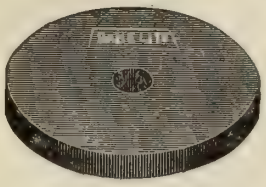
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Valve Discs

One Disc for all Purposes

Replace Soft Discs, Hard Discs and Metal Discs.

NOT till this wonderful new material —BAKELITE—was invented could a composition valve disc be found that would not soften, fuse or crack from moisture, steam or chemicals.

Every engineer knows this.

BAKELITE is the new material which has brought valve troubles to an end.

BAKELITE stands an enormous amount of friction wear.

Your leaking valves with frequent replacement of discs are not necessary. Put in Bakelite Valve Discs and the leaking will cease. This is the only material in the world that embodies in one disc the advantages not only of the usual soft and pliable discs for water but also of the hard and tough composition discs or special metal discs for the hottest steam. They cost less than metal.

Made for all sizes and types of valves.

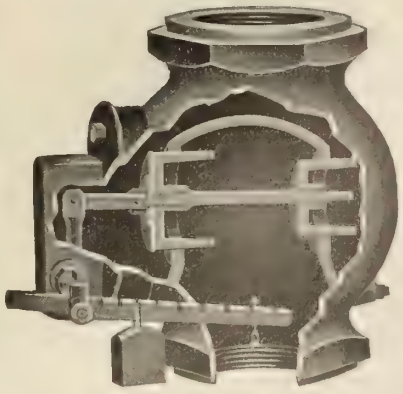
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TORONTO

Eastern Agents for Bakelite Discs
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Double Seated Noiseless Back Pressure Valve



The construction of the inner Valve and seats is of such a nature that uneven expansion of the metals will not cause the Valve to STICK or BIND—A FEATURE which places this Valve in a class by itself. ANOTHER FEATURE of our Back Pressure Valve is that it can be placed in ANY POSITION.

It is a DISTINCT improvement on the OLD STYLE single seated Valve. It has a DOUBLE PISTON TYPE of inner Valves, with disc of different area.

Guaranteed close regulation without excessive weighting. Carried in stock from 2 to 16 inches.

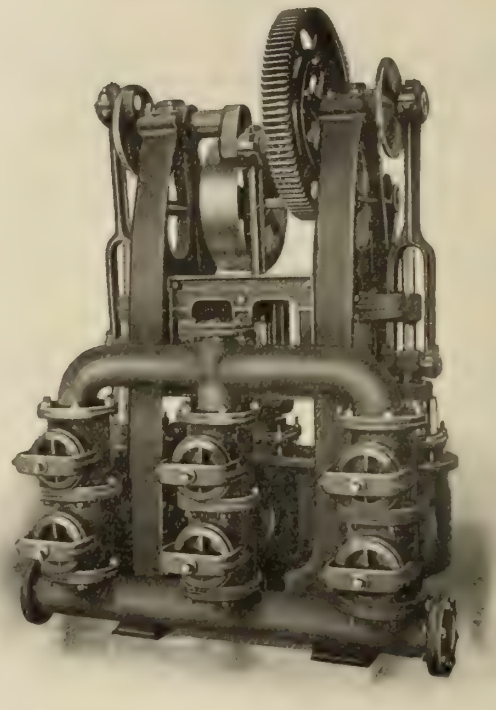
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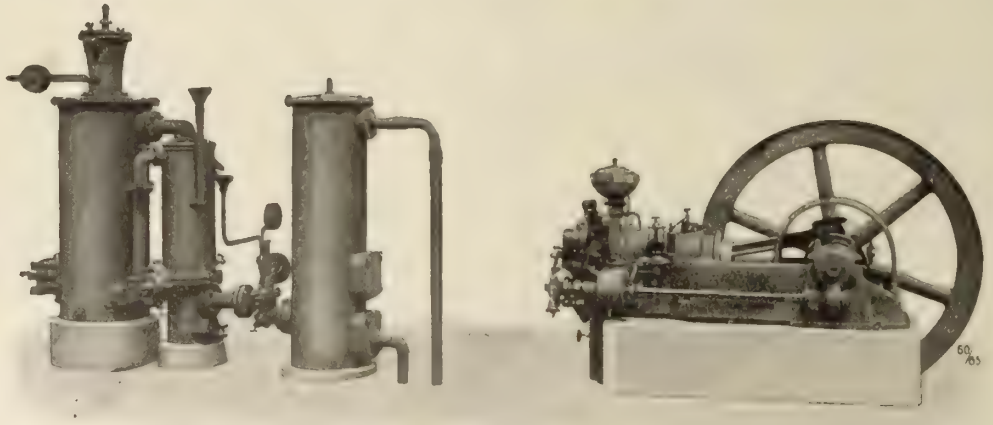
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(Copy)

Noon Universal Coupler Co., Limited, Toronto, Ont. Toronto, Sept 5th, 1911.

Dear Sirs,—We have been using the Noon Universal Hose Coupler since April 1st, and we are pleased to state that it is the most efficient coupling we have ever used and gives perfect satisfaction.

We were the first people to use these couplers

Yours truly, TORONTO IRON WORKS, LTD.,
J. H. Malone, Superintendent.

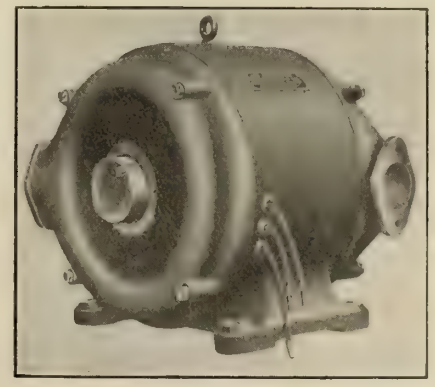
Write for our prices and literature.

THE NOON UNIVERSAL COUPLER CO.
LIMITED
Room 603, Kent Bldg., TORONTO, ONT.

The Lancashire Dynamo & Motor Co., Limited
152-4 Bay Street, Toronto

Electrical Machinery

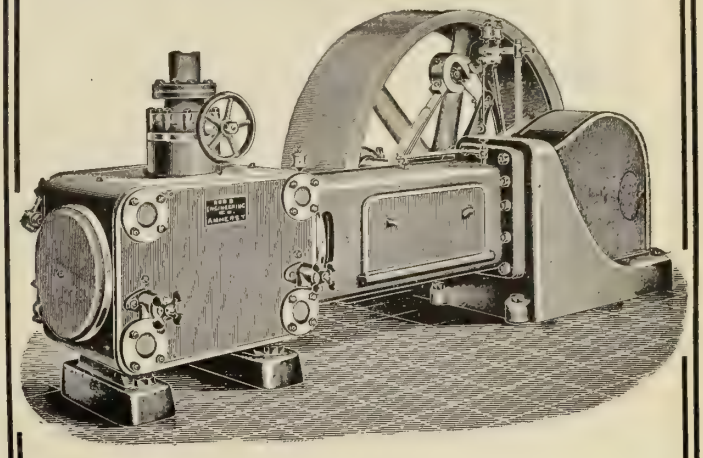
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CORLISS ENGINES

have triple-ported valves of the Corliss type, but a more simple valve gear.



The valves close quickly and positively because there are no springs, dash pots, or disengaging parts which sometimes fail to operate on time.

The cut-off is controlled by the direct action of the governor, not by the indirect action of spring releasing gear.

The shorter stroke and compact frame eliminate the vibration always found in long stroke, girder-frame engines.

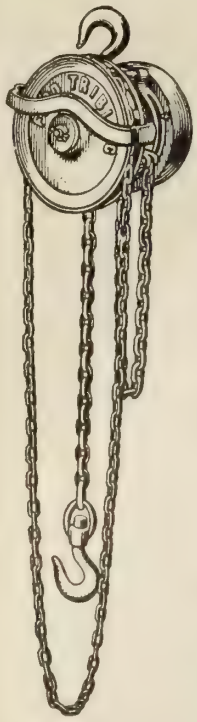
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39-4



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Costs less—the Peer of all

Steel Working Parts

All sizes—¼ to 40 tons.

Highest efficiency. Parts interchangeable. Repairs for triplex blocks in stock.

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Write for catalog and remember—the *Gem guarantee is binding.*



GEM GUARANTEE GOOD



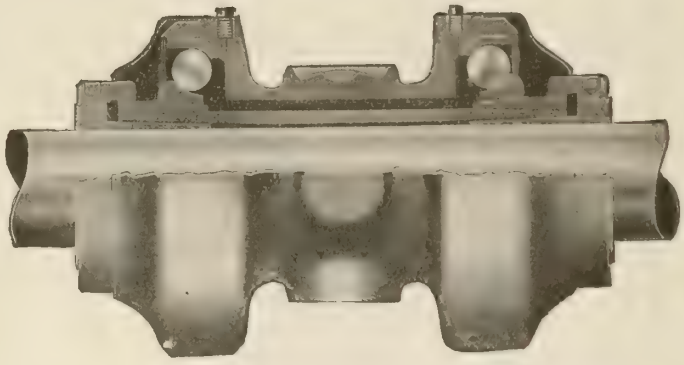
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is an economical oiler

It has a patent cleaning device that saves time and oil. It is exceptionally strong, machine made and interchangeable in all parts. Its durability is guaranteed. Made for all purposes.

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You insist on the most efficient machinery and men in your plant.

You worry about the efficiency of your power plant and the cost of your power.

Why not install the most efficient transmission equipment in your factory?

Chapman Double Ball Bearings

have shown by eight years' hard service that they save from 15 per cent. to 30 per cent. of the entire power of a factory.

Can you afford to throw this away?

Think this over, and give us a chance to bring your transmission equipment up to the same degree of efficiency that you maintain in the balance of your plant.

The Chapman Double Ball Bearing Company of Canada, Ltd.

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PHONE PARK 2790

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Oneida Steel Pulleys are a quarter to a third the weight of cast iron and therefore save from two-thirds to three-quarters of the power required to revolve a cast iron pulley.

The oval crown face fits the belt perfectly, offering 20% better belt adhesion than any other pulley on the market.

Do You need Economy?
Get the Oneida.
It is the best.

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Oneida Steel Pulley Co.
Oneida, N.Y.



New Process Noiseless Pinions Are Durable

New Process Pinion taken from a street car motor after fifteen months' service during which the car averaged 105 miles per day.

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37

The NEW PROCESS RAW HIDE Co.
OFFICE & WORKS N.P.R.H. SYRACUSE, N.Y.

GOODHUE BELTING

Minimise Your Belting Expense by Using

Goodhue Belting

It stretches from 15% to 25% less than any other Belting, thereby saving much time in shortening.

This is the result of the great care taken in stretching before the Belt is completed—none of the unstretched parts are ever used in a finished Belt.

Write us at once for Particulars

Goodhue Belting

Has just the right amount of cling on the Pulley—a cling that transmits every particle of power your engine can develop.

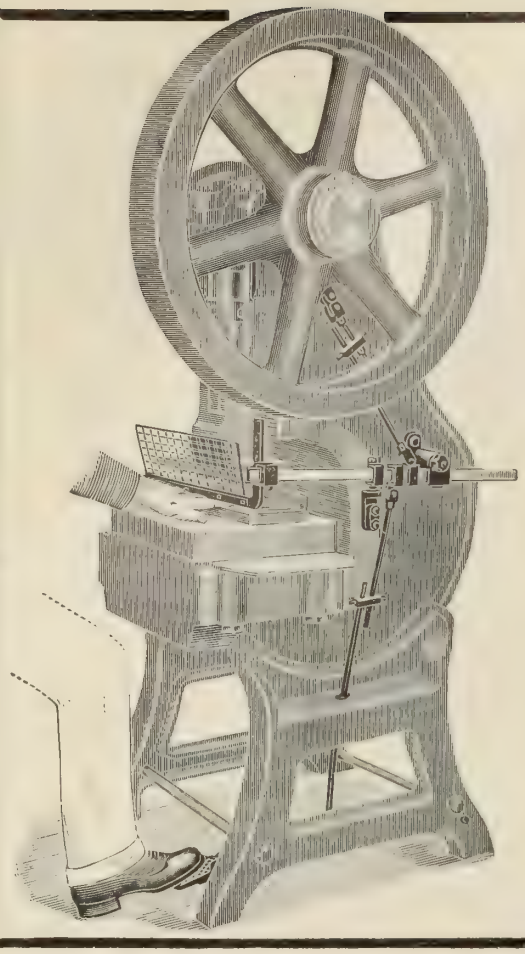
It is a safe entry for the race of superiority, as it has never been known to fall short of what we claim.

"Extra," "Standard" or "Acme" Waterproof Belts suit all the varying conditions of use. Don't pay for Belting that will prove an expense—our Belts are the dependable and guaranteed kind.

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J. L. GOODHUE & COMPANY, LTD.
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Will increase the efficiency of your men and your machine.

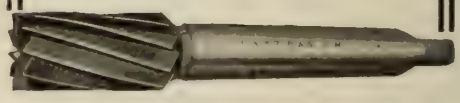
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Any Size, Shape or Form

Safe—Strong—Reliable

Highly recommended by Liability Companies and Factory Inspectors.

Send for leaflet and prices.

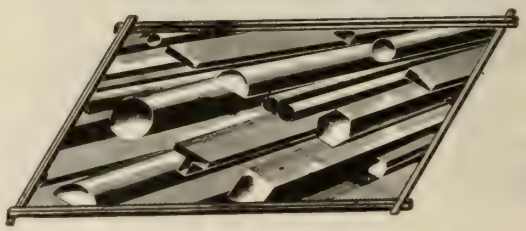
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Small Steel Castings Crucible and Converter

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Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

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Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

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assures highest economy and efficiency.

To get a belt that will transmit the most possible power we have studied and tested for over 30 years—now we produce a practically perfect belt that is without any near rival for superiority.

The cost of up-keep of "AMPHIBIA" Belting is considerably less than on any other ordinary belting.

"AMPHIBIA" Belting is made to suit every purpose as follows.

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Jeffery Correspondence Schools Endorsed

¶ On page 616, August edition of **"The Boilermakers' Journal"** a correspondent, signing himself "By a Brother," after being benefited himself, endorsed Mr. H. S. Jeffery, of the Jeffery Correspondence Schools, as follows:

> One of our brothers is willing to teach you for a low figure, as seen in the advertising pages of this Journal. I am not his agent, have nothing to do with his school, but he has helped me in book learning very much, has thrown all his ability, knowledge and experience an our side when the federal locomotive boiler inspection bill was up for consideration in Congress, and thus if you want to acquire theoretical knowledge I say give him a chance before anyone else. He has the knowledge, ability and experience to help you far more than any professor or mere theoretical man. You want practical knowledge, such as I have given or tried to give you here, and such you will get of our brother, H. S. Jeffery.

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Harris Heavy Pressure
The Babbitt Metal Without a Fault
IS THE BEST
For All General Machinery Bearings



Harris Heavy Pressure
Will Prove Satisfactory where other Babbitts Fail.
It is Copper Hardened, Runs Freely and makes a bearing that will last.
WRITE FOR PRICE LIST
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PERFORATED METALS
Describe your need.
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Inquiries solicited.
We make any size perforation in any kind of metal required.
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We also manufacture
Wire Cloth for all purposes
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BLISS INCLINABLE PRESSES



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They are adapted for nearly all the operations required in the manufacture of tin cans, pieced tinware, metal packages, electrical goods, brass goods, trimmings, etc.

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Slide—The slides fitted with positive knock-outs are of unusual length and well gibbed, insuring better work and increased life of tools.

Connection—The connections permit of rapid and accurate adjustments, have long adjustments, and they stay where set.

Shaft—The shafts are forged steel and of ample proportions to stand the heaviest strain without springing.

Clutch—The "Bliss" positive clutch, a powerful and simple clutch, is furnished.

Fly-Wheel—The fly-wheels are of large diameter, bronze bushed and fitted with two locking points.

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18 sizes, all in stock—Send for Catalogue No. 1-G describing them, stating requirements.

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MODERN FIREPROOF CONSTRUCTION—Our system of reinforced concrete work, as successfully used in many of Canada's largest buildings, gives better results at lower cost. "A strong statement," you will say. Write us and let us prove our claims. That's fair. Leach Concrete Co., Ltd., 100 King St West, Toronto. (tf)

MR. BUSINESS MAN, are you progressive? It's up to you to test "Consolidated," our new process carbon paper. Because it costs less. Soft finish, without smutting, and clear, permanent copies. Write for sample sheets and prices. "Consolidated," Stratford, Ont.

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THE "Kalamazoo" Loose Leaf Binder is the only binder that will hold just as many sheets as you actually require and no more. The back is flexible, writing surface flat, alignment perfect. No exposed metal parts or complicated mechanism. Write for booklet. Warwick Bros. & Rutter, Ltd., King and Spadina, Toronto.

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FREE FACTORY SITES—Seven railroads, deep water, Niagara power, natural gas, low taxation, abundant labor. Welland, Ontario. B. J. McCormick. (12y)

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BELTING, RUBBER, CANVAS AND LEATHER, Hose Packing, Blacksmith's and Mill Supplies at lowest price. N. Smith, 138 York Street, Toronto. (2tf)

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Keep in mind the dominant fact that mankind from its first appearance on the earth has been schooled by nature to look for signs; for invitations to taste; for suggestions as to what to wear. Tell your story briefly, forcibly, truthfully, and address it through the proper media and you can successfully apply advertising as a means to increased distribution.

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LUMEN BEARING COMPANY, TORONTO

LUFKIN MACHINE DIVIDED RULES
ARE STANDARDS OF ACCURACY AND MATERIALS
Our catalog tells about their many superior features.
It's sent free on request.
THE LUFKIN RULE CO. OF CANADA, LTD.
WINDSOR, ONT.

CINCINNATI LATHES

WITH THEIR CAPACITY TO STAND YEARS OF SERVICE, HAVE WON THE CONFIDENCE AND APPRECIATION OF USERS EVERYWHERE. SUPPLY QUICK CHANGE OR STANDARD GEARED FEED BOX HAVING AN UNLIMITED RANGE. DETAILED INFORMATION ABOUT THESE DEVICES AND VARIOUS ATTACHMENTS SENT UPON REQUEST

The Cincinnati Lathe & Tool Co. - Cincinnati, Ohio, U.S.A.

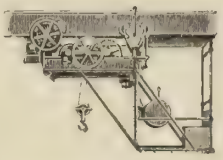
¶ These cranes have every recent improvement in crane practice and many exclusive features.

Bulletin Free

All Sizes and Types Electric or Hand

NORTHERN CRANES

NORTHERN ENGINEERING WORKS, Detroit, Mich., U.S.A.
or, Canadian Dept., ADVANCE MACHINE WORKS, Ltd., Walkerville, Ontario.



Electric Hoists
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Overhead Trolley Tracks and Trolley Systems

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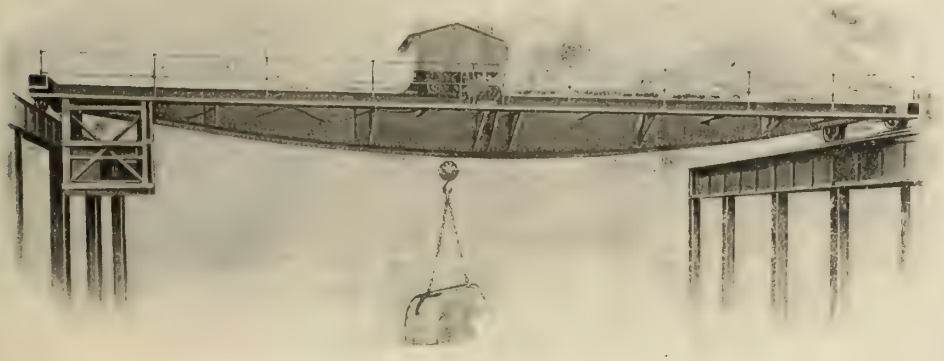


Photo of 5-ton Motor Travelling Crane, 60-foot span

Geo. Anderson & Co., Ltd.

86 Notre Dame St. West
MONTREAL
and CARNOUSTIE, SCOTLAND.

Makers all sizes of

Travelling Cranes
Electric Derricks
Steam Derricks
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Send for catalogue and Prices.

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Claremont Ironworks,
Halifax, England.
Machine Tools. Specialities, High Speed Radial Drills and Lathes.

All types of
LOCOMOTIVES
built by
R. & W. Hawthorn, Leslie & Co.
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Catalogues on application. Established 1817

BERTRAMS LIMITED
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Sciennes, EDINBURGH
PAPER MILL MACHINERY
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MACHINE TOOLS for IRON WORKERS
Catalogues offered to Purchasers.

THOMAS A. ASHTON, LTD.
SHEFFIELD, ENG.
Mill-Gearing Engineers
High-Grade Goods
Reasonable Prices
On Government Lists Established 1866

THIS SPACE
£4.4s A YEAR

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Limited
MACHINE TOOLS
HALIFAX - - - ENGLAND

FRANK PEARN & CO., Ltd.
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PUMPING MACHINERY
driven by Steam, Electric Motor, Gas or Oil Engines
High-Speed Surfacing and Boring Machine.

H. W. WARD & CO., Ltd.
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92 Lionel Street, Birmingham
Specialities—Capstan and Turret Lathes, Toolmakers' Lathes, Milling Machines, Grinding Machines, Drilling Machines.
Telegrams—"Tudor," Birmingham

MACHINE TOOLS
Specialties:—Boring & Turning Mills (Single & Duplex Types) Multiple Spindle Drilling, Tapping and Boring Machines.
Automatic Profile Milling Machines
WEBSTER & BENNETT LTD.
COVENTRY, England
Cablegrams: "Profile Coventry."
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CRANES

ELECTRIC TRAVELERS

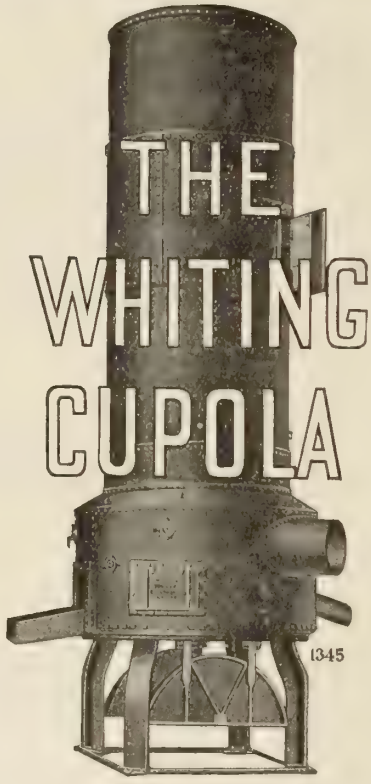
Complete Foundry Plants

Grey Iron, Brass, Car Wheel, Pipe, Steel and Malleable.

Designed—Equipped—Installed

Our experts assist starting Steel (O.H. & Converter) Malleable and Iron Foundries at a reasonable charge.

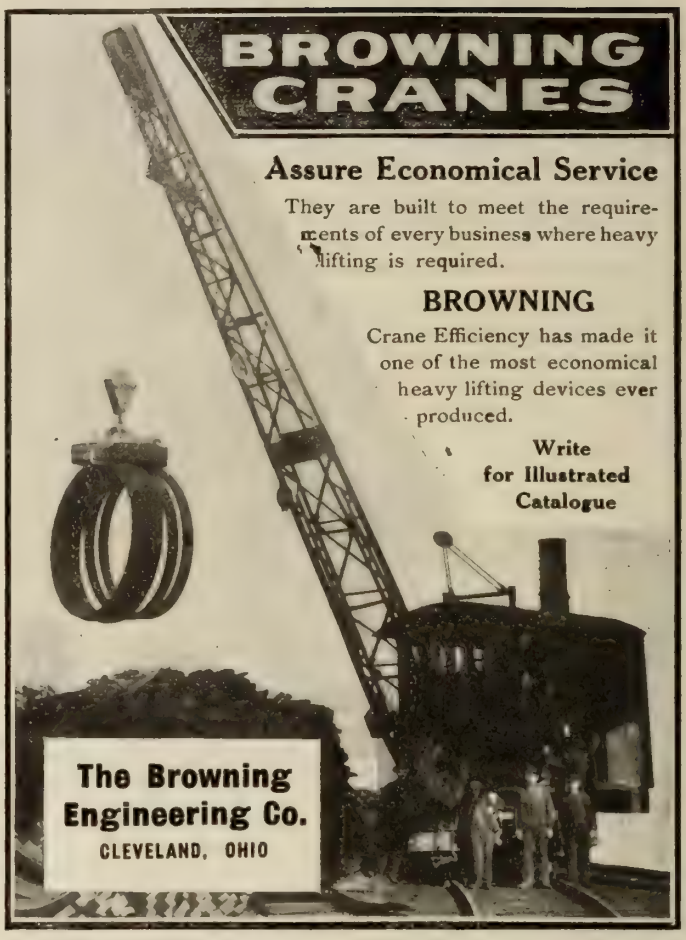
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Tumblers, Trucks, Ladles, Core Ovens, Core Oven Cars, Elevators, Air Hoists, Converters, Furnaces (Brass, Malleable & O.H.), Annealing Ovens—Tramrail systems, Turntables, Sand Sifters.

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

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Assure Economical Service

They are built to meet the requirements of every business where heavy lifting is required.

BROWNING

Crane Efficiency has made it one of the most economical heavy lifting devices ever produced.

Write for Illustrated Catalogue

The Browning Engineering Co.
CLEVELAND, OHIO

This Gravity Molding Machine



really is the only one on the market that completes a perfect mold automatically without stripping-plates or hand-work. You cannot afford to be without it.

WE ALSO CARRY

Jar and Squeeze Molding Machine.

Hauck Oil Burners.

Cyclone Hoists.

Acme Parting

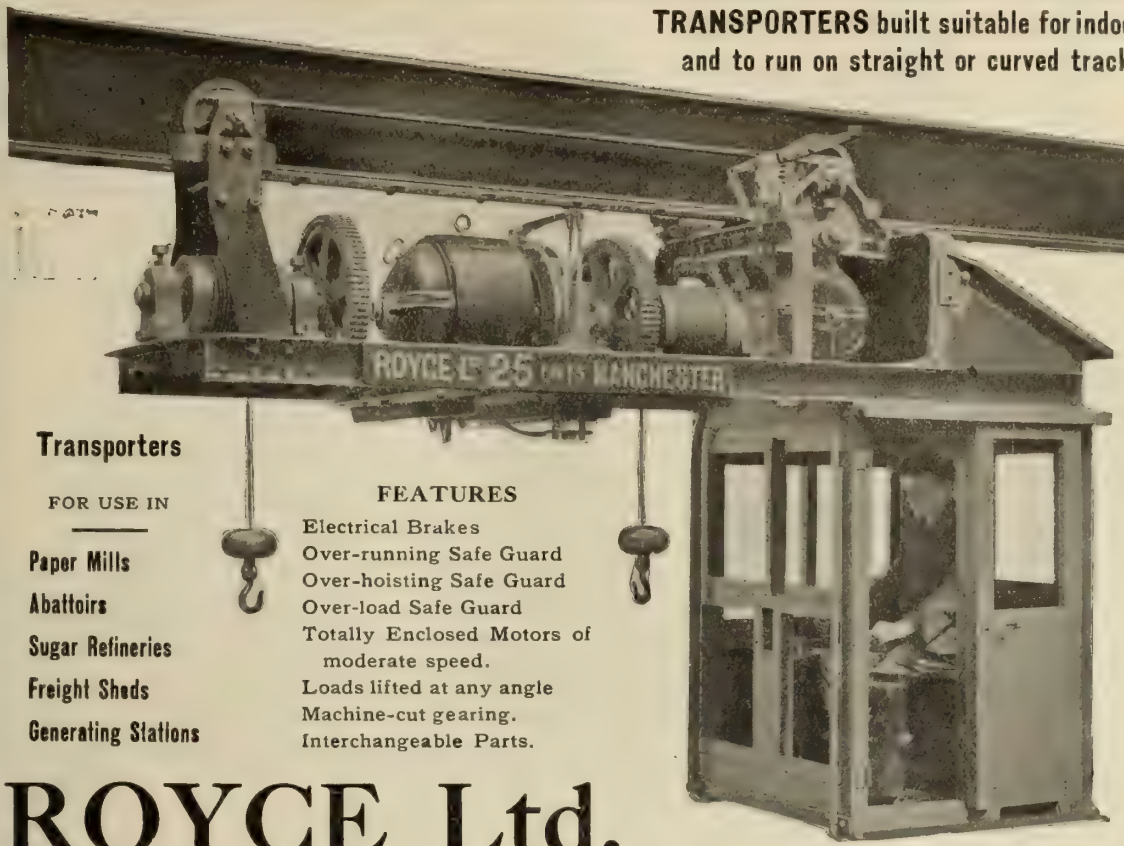
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WINNIPEG TORONTO CALGARY

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TRANSPORTERS built suitable for indoor or outdoor use, and to run on straight or curved tracks as required.



Transporters

FOR USE IN

- Paper Mills
- Abattoirs
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- Electrical Brakes
- Over-running Safe Guard
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- Loads lifted at any angle
- Machine-cut gearing.
- Interchangeable Parts.

WE SPECIALIZE IN

Electrical Cranes Capstans Transporters Winches

Ask for Bulletin regarding special features

ROYCE Ltd.

TRAFFORD PARK, MANCHESTER, ENGLAND

CANADIAN OFFICE, 207 Lumsden Building, TORONTO

MANUFACTURER! THIS MEANS DOLLARS TO YOU

LET GRAVITY DO YOUR WORK. THE MATHEWS GRAVITY CARRIER CO. ORIGINATED CONVEYING BY MEANS OF THE STEEL BALL BEARING ROLLERS AND STRAIGHT LIFT ELEVATORS.

SAVE TIME & LABOR



Systems designed without expense.

Write for CATALOGUE

MADE IN CANADA.

THE ABOVE CUT REPRESENTS a Manufacturing Plant equipped so that the product travels automatically from any floor above to the ground floor or from the ground floor to any floor above without the aid of other labor than that of placing boxes or barrels upon the carriers at the starting point.

Canadian Mathews Gravity Carrier Company, 312 Stair Building, Toronto



GLUTRIN

Low first cost—low mixing cost—low cleaning cost. These all indicate glutrin, the best core sand binder.

Robeson Process Company

Grand Mere, P.Q.

Selling Agents:

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FREE INSTRUCTION BOOK

SEND FOR IT TO-DAY

This book should be within instant reach of every engineer. It tells clearly, by photograph and formula, how to use the well-known Smooth-On Iron Cements in repairing boilers, engines, castings, tanks, joints, etc.

Used according to instructions, Smooth-On Cements will save more actual time and money in the engine and boiler room than any single product manufactured. Their uses are innumerable, and their repairs absolutely permanent.

Smooth-On Mfg. Co.,

JERSEY CITY, N.J.

For Sale by Supply Houses.



"DOMINION" Emery Wheels

are made in any shape for every purpose.

Ask for them of our Agents

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Or send direct to the Manufacturers

The Dominion Abrasive Wheel Co., Limited

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PITTSBURGH EMERY WHEEL CO.

MANUFACTURERS OF

EMERY WHEELS—All kinds and shapes.

SWING FRAME GRINDING MACHINES—Motor and Belt Driven.

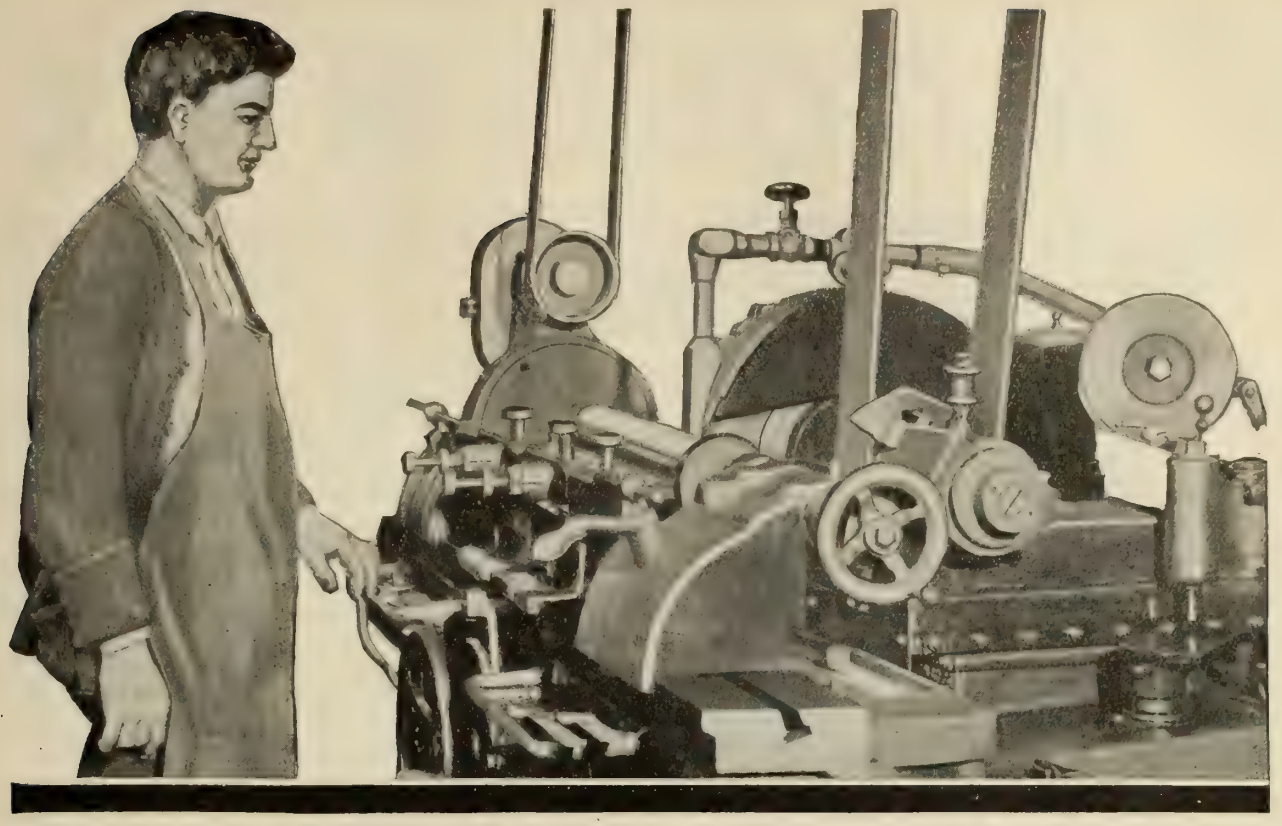
CANADA FORD CO.

Montreal

603-604 Park Building,

Pittsburgh, Pa.

The advertiser would like to this paper in writing to advertisers.



Carborundum Grinding Wheels

Are the Wheels of To-day and To-morrow

IN hundreds of shops, under innumerable conditions, Carborundum wheels are to-day proving their ability and economy. They will do the same thing to-morrow, and as long as prudent grinders realize the value of the wheels that do more work, better work and last longer. As evidence: the cylindrical grinding of 40 to 50 pieces of 20 point carbon steel tubing, 2 feet long, 4½ inches diameter, in a day, at a Pennsylvania plant. A 16-inch Carborundum wheel does the work—gives a splendid finish—cuts fast—stands up to the task. 30 pieces with an inferior finish was all they ever got with the best of other wheels. This is just an ***every day*** evidence of the superiority of Carborundum.

¶ Don't handicap your men or increase your production cost with poor wheels. Let us help you get the right wheel in the right place. Write us.

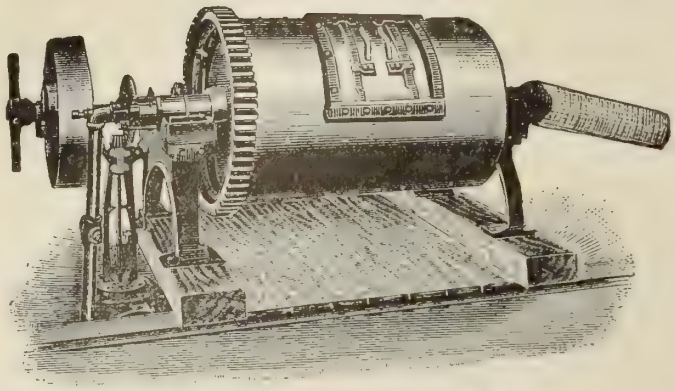
The Carborundum Company, NIAGARA FALLS, N. Y.

AGENTS:

NORMAN MACDONALD, 145 Wellington Street West, TORONTO, CAN.
McLENNAN, McFEELY & CO., VANCOUVER, B. C.
WILLIAMS & WILSON, MONTREAL, QUE.
A. R. WILLIAMS MACHINERY CO., of WINNIPEG, Limited, WINNIPEG, MAN.

A GOLD MINE

SAVE YOUR IRON



SLY'S PATENT IRON CINDER MILL

Patented, No. 514097. Patented, No. 841728.

may be at your disposal on your very premises. Look out of your side window or back door and see if you have not an accumulation of cupola dump, and other foundry refuse, which is a total loss to you in its present state. Why not add to your profits and install one of the Sly Patent Cinder Mills to reclaim this iron and be astonished at your former loss and pocket the rich returns from your newly-discovered mine.

Sly's Patent Iron Cinder Mill will save 95% of the iron contained in your cupola dump and gangway scrapings and 75% of the coke. Iron is valuable, then why throw it in the dump? Iron recovered by this Mill is better than machinery scrap. Study economy in a foundry and your profits will increase accordingly. Mill will pay for itself three or four times every year, and we have records of Mill paying for itself twelve times a year. Let us know amount of your daily melt and we will quote. *Write for Cinder Mill Catalogue F.*

We also manufacture Cleaning Mills, Dust Arresters, Sand Blast and Foundry Equipment.

THE W. W. SLY MFG. CO., CLEVELAND, O.

The Making of Hollow Castings

The recent introduction of King Kore Kompound has now rendered this, once somewhat difficult, part of Foundry practice comparatively easy.

It has, also, reduced the core expense by more than one-half.

This compound is a black, dry powder, and is used as flour is used, but with one-half the quantity is produced greater and better results.

Its use avoids the danger of swelling or "blowing." The core easily comes out of the casting, and when old cores are ground up, in the rattler, or otherwise, the sand so made is used over again.

The core compound it contains, again becomes a binder under heat of the core oven, as it melts, and so it is used over and over again.

This is Foundry Economy; Flour, Rosin, etc., are now luxuries.

A barrel of King Kore Kompound will be sent "subject to approval" to any inquiring mind.

That is the **Stevens' System** of trying before buying.

I have copies of proportions of compound to sand used and methods followed in core rooms of Foundries in thirteen different States. This information, with other printed matter relative to the subject, will be mailed on request.

I maintain a direct branch at 137 Jarvis St., Mr. J. M. Mayers, Manager, Toronto, Ont., where is stocked a supply of **Foundry Facings, Foundry Supplies, Buffing Compositions,** of my own manufacture.

The stamp of quality pervades them all.

FREDERIC B. STEVENS

Main Office - - - - - - DETROIT, MICH.

Canadian Branch - - - 137 Jarvis Street, TORONTO.

SANDS, PLUMBAGOS, FACINGS, GLUTRIN, FIRE BRICK, AND CLAY.

THE FACT THAT WE REPRESENT IN CANADA

Pettinos Bros. of Bethlehem, Pa.

The Largest Producers of all Grades of
SANDS, PLUMBAGOS AND FACINGS

The Robeson Process Co., Au Sable Forks, N.Y.

MANUFACTURERS OF GLUTRIN

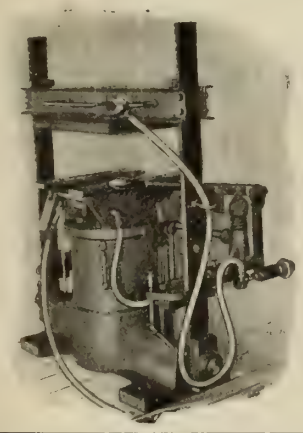
The Harbison-Walker Ref. Co., Pittsburg, Pa.

FIRE BRICK AND CLAY

Ought to be sufficient to warrant the Foundryman
to place his business with us.

F. HYDE & COMPANY

31 Wellington Street - - Montreal, Que.



A LIGHT POWER SQUEEZER FOR BENCH WORK

and a complete line of

FOUNDRY MOULDING MACHINES FOR ALL KINDS OF FOUNDRY WORK

Standard and Other Types to Suit Conditions

THE TABOR MANUFACTURING CO.

18th and HAMILTON STS. PHILADELPHIA, PA., U.S.A.

Detroit Solvay Coke

AVERAGE ANALYSIS

91% Carbon, 8% Ash and 65/100% Sulphur.

The analysis of contents of every car is shown on every invoice.

Insures Increased Melt
and Extra Fine Castings.

BAIRD & WEST

DETROIT

Sole Selling Agents Detroit Ovens.



OXYACETYLENE and all systems of WELDING and CUTTING PLANTS.

For welding steel, cast iron, copper, brass, lead, aluminum. For cutting steel and wrought iron. It helps you to KEEP YOUR SCRAP HEAP CORNER EMPTY.

Have your broken castings repaired. Do not lose time waiting for new castings. They can be repaired by welding the cracks and broken parts by the autogenous welding process and made as good as new.

Blow holes in rough or machined castings of any metal filled up. Holes drilled by mistake filled up. Broken or cracked gasoline engines and automobile cylinders welded. Broken or cracked pulleys, gear wheels, etc., welded. Flanges welded on pipes. Metal added on parts worn out by friction. Teeth renewed on broken gear wheels. ***Transformer tanks and all kinds of tanks entirely made by welding, absolutely water or oil tight and to stand pressure.*** Cutting steel or wrought iron of any thickness and in any position. Cracks and corrosions in boilers a specialty.

OXYGEN

of guaranteed purity made by the Claude's Process. The largest and most up-to-date plant now in operation on this continent. Is supplied at a low price to all users of the process.

Sample and Repair Work Undertaken.

R. J. LEVY, Manufacturer of Oxygen **Maisonneuve, Montreal**

Telephone East 6713 Let Us Send You Full Particulars

Canadian Agent for the "Societe L'Air Liquide" Paris

DON'T BE A PRICE BOOSTER

¶ Be a cost reducer.

¶ More money in the latter for you—for your customer.

¶ Somewhere in your factory there is an opportunity to reduce your costs by using our Seamless Steel Tubing or employing our process of Electric Welding in the manufacture of various parts.

¶ Hundreds of manufacturers are saving large amounts annually by employing this method, and at the same time are improving the quality of their product.

¶ We are pioneers and experts in this art, and as such, feel qualified to answer any questions you may ask regarding it.

¶ Look over your forgings and parts, pick out one you think should cost less than it does—consult us.

¶ Our estimate will undoubtedly verify your think.

STANDARD WELDING COMPANY

"FIRST IN THE FIELD"

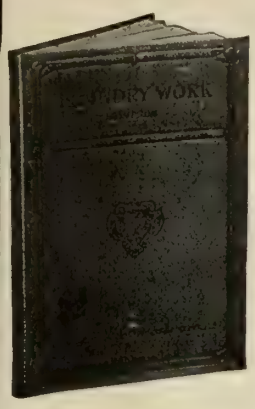
CLEVELAND, O., U.S.A.

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if you are a subscriber to "Canadian Foundryman," by sending in to us four new paid-up subscriptions. If you are not a subscriber send in your own, along with the proper number of paid-up subscriptions and the book is yours.



Foundry Work

By Wm. C. Stimpson

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160 pp., 150 illus. Cloth binding. A practical guide to modern methods of molding and casting in iron, brass, bronze, steel and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc.

Price, $1.00

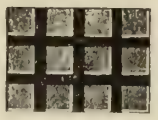
Given free with four yearly paid-up subscriptions.

The subscription price is fifty cents per year; two years for one dollar.

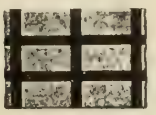
Canadian Foundryman

143-149 University Avenue, Toronto

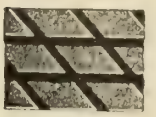
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Brazing Plates



No. 1
For Brazing Brass, Red Copper & Bronze



No. 2
For Brazing Red Copper and Iron



No. 3
For Brazing Iron and Steel

These three contain all the necessary ingredients for a perfect braze, including a great proportion of copper solder.
As they melt at different heats it enables the brazier to have a solder which fuses at a lower heat than the metal being brazed.
Does quicker, cleaner, better work. No swelling or blistering.
Leaves braze free from oxides and residue ready to finish.

SAMPLES FREE on request.

Complete stock of Laffitte Products carried by active dealers throughout Canada

THE PHILLIPS-LAFFITTE COMPANY

801 Penna. Bldg., Philadelphia, Pa., U.S.A.

Electric Welding

No Holes to Punch - No Rivets Used

DOES IT PAY?



Welding Ears on Buckets

THE ELECTRIC WAY——

On the job shown above, an operator will turn out 3000 complete pieces per day.

THE COST—6,000 ears—Labor.....$2.50
Current.... .60
$3.10 for 3,000 pieces.

$1.04 per 1000

THE OLD WAY——

The best an operator could do was 2,000 complete pieces per day.

4,000 ears—8,000 rivets cost..... $ .48
Labor punching holes 1.60
Labor riveting 2.00
$4.08 for 2,000 pieces.

$2 04 per 1000

To The Toledo Electric Welder Co., Cincinnati, Ohio.
Please send free catalogue on Electric Welding.

Name.....
City.....
Street.....
State.....

Canadian Machinery

A Stronger and Neater Job for Half the Money

The electric current fuses and melts the metal at one little spot under the points of the copper dies. **It's done as quickly as electricity can go through the metal.**

Send us a sample of your work; we will weld it for you and tell you what it will cost you to weld the same pieces by the thousand. You can then figure out whether it will pay to buy a welder or not.

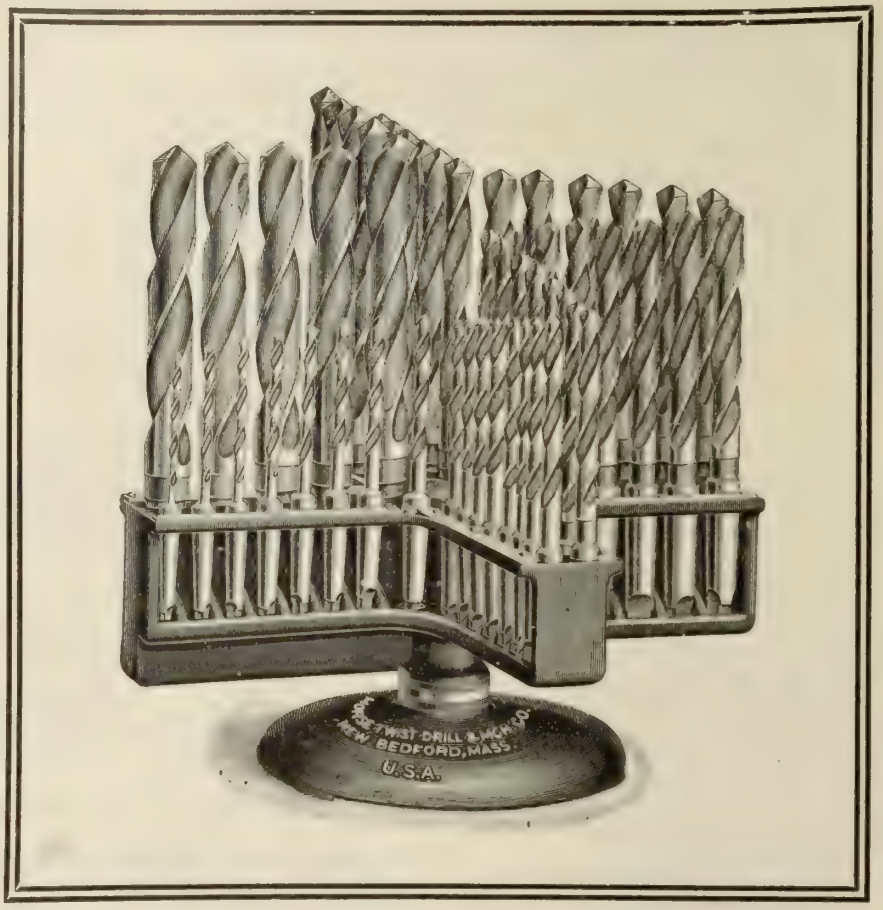
Our specialty is manufacturing welding machines for Butt welding or Spot welding anything that's weldable. Our catalogue tells about them and it's yours for the asking.

NO LEASE NO LICENSE NO ROYALTY.

THE TOLEDO ELECTRIC WELDER COMPANY

CUMMINSVILLE, - CINCINNATI, OHIO

"MORSE"



Twist Drills

Reamers, Cutters, Etc.

of Carbon and High Speed Steel.

Convince yourself. A trial is a speedy, logical, convincing, clinching argument to use them in your shop.

Morse Twist Drill and Machine Co.

New Bedford, Mass., U.S.A.

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You will often get information that will save you money.
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Gardner, Robt. & Son, Montreal
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Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Babbitt Metal.
Canada Metal Co., Toronto.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Lumen Bearing Co., Toronto.
Magnolia Metal Co., New York
Tallman Brass & Metal Co., Hamilton

Ball Bearings.
Chapman Double Ball Bearing Company, Toronto
John Millen & Son, Ltd., Montreal

Balls, Steel.
Hermann Boker & Co, Montreal
John Millen & Son, Montreal

Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Belting, Chain.
The Canadian Fairbanks Co., Montreal
Jones & Glassco, Montreal
John Millen & Son, Montreal
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Dominion Belting Co., Hamilton.
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa

Belting, Leather.
The Canadian Fairbanks Co., Montreal.
General Supply Co of Canada, Ottawa
J. L. Goodhue & Co., Danville, P.Q.
Imperial Waste & Metal Co., Montreal
McLaren, J. C., Montreal.
National Mach. & Supply Co., Hamilton
Sadler & Haworth, Montreal

Belting, Rubber
Goodyear Tire & Rubber Co., Toronto

Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
Bertrams Limited, Edinburgh, Scotland
Bliss, E. W., Co, Brooklyn, N.Y.
General Supply Co. of Canada, Ottawa
Jardine, A. B. & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Long & Alstatter Co, Hamilton, O
Mussens, Limited Montreal
National Machinery Co., Tiffin, Ohio.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Boilers.
Canadian General & Shoe Machinery Co., Levis, Que.
General Supply Co of Canada, Ottawa
Goldie & McCulloch Co., Galt.
International Marine Signal Co., Ottawa
Mussens Limited, Montreal.
National Mach & Supply Co., Hamilton
Owen Sound Iron Works Co., Owen Sound
Robb Engineering Co, Amherst, N. Scotia
Eng Company, Montreal
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford.

Boiler Compounds.
Hall Engineering Works, Montreal.

Boiler Feed Regulators.
Standard Engineering Co., Toronto.

Boiler Makers' Supplies.
Jno. F. Allen Co., New York

Boiler Mountings.
Standard Engineering Co., Toronto.

Boiler Settings.
Harbison-Walker Refractories Co., Pittsburg

Bolt and Nut Machinery.
John Bertram & Sons Co., Dundas, Ont.
Foss & Hill Machinery Co, Montreal
Gardner Robt. & Son Montreal
General Supply Co. of Canada, Ottawa
Joshua Heap & Co., Ltd., Ashton-under-Lyne, Eng.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Machinery Co., Tiffin, Ohio.
National Mach. & Supply Co, Hamilton
Niles-Bement-Pond Co. New York.

Boring Machines, Upright.
John Bertram & Sons Co., Dundas, Ont.
Foss & Hill Machinery Co., Montreal
General Supply Co of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York
Springfield Machine Tool Co., Springfield, O.

Boring Machines, Pneumatic.
The Canadian Fairbanks Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
General Supply Co. of Canada, Ottawa
Independent Pneumatic Tool Co., Chicag, Ill.
London Mach. Tool Co., Hamilton.
Mussen Limited, Montreal.

Boring and Turning Mills.
John Bertram & Sons Co., Dundas, Ont.
Bullard Machine Tool Co., Bridgeport, Conn
Foss & Hill Machinery Co., Montreal.
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens Limited Montreal.
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co, Cleveland.
Francis Hyde & Co., Montreal.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland.
Francis Hyde & Co., Montreal.

Brake Shoes.
Canadian Steel Foundries, Montreal

Brass Working Machinery.
Gardner Robt. & Son Montreal
General Supply Co. of Canada, Ottawa
Mussen Limited Montreal.
National Mach. & Supply Co., Hamilton
Warner & Swasey Co. Cleveland, Ohio.

Brazing Compounds.
Phillips-Laffitte Co., Philadelphia

Buckets, Clam Shell & Grab.
Browning Engineering Co., Cleveland, O.
Whiting Foundry Equipment Company, Harvey, Ill.

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co, Brooklyn, N.Y.
Foss & Hill Machinery Co., Montreal
London Mach. Tool Co., Hamilton, Ont
National Mach & Supply Co, Hamilton
Niles-Bement-Pond Co., New York.

Burners, Fuel Oil and Natural Gas.
Rupert G. Bruce Co., Ltd., Toronto
Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York
Whiting Foundry Equipment Co., Harvey, Ill.

Burrs, Iron and Copper.
Parmenter & Bullock Co, Gananoque

Calipers.
Schuchardt & Schutte, New York

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y
National Mach. & Supply Co., Hamilton

Capstans
Royce, Ltd., Toronto.

Car Replacers.
Canadian Steel Foundries, Montreal
Montreal Steel Works, Montreal
Mussens, Limited, Montreal

Car Wheels, Mine.
Canadian Steel Foundries, Montreal

Cars, Industrial.
Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Francis Hyde & Co., Montreal
Mussens Limited Montreal.
Sheldons, Limited, Galt
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Lumen Bearing Co, Toronto
Tallman Brass & Metal Co., Hamilton

Castings, Brass.
Hall Engineering Works, Montreal.
Lumen Bearing Co., Toronto
Owen Sound Iron Works Co., Owen Sound.
Tallman Brass & Metal Co., Hamilton
Waterous Engine Works Co. Brantford

Castings, Grey Iron.
Gardner, Robt. & Son, Montreal
Hall Engineering Works, Montreal.
Owen Sound Iron Works Co., Owen Sound
Springfield Machine Tool Co., Springfield, O.
Waterous Engine Works Co, Brantfor

Castings, Steel and Manganese Steel.
Canadian Steel Foundries, Montreal

Castings, Malleable.
Galt Malleable Iron Co., Galt
Pratt & Letchworth, Brantford
Smiths Falls Malleable Castings Co., Smiths Falls

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Cement, Iron.
Shelton Metallic Filler Co., Derby, Conn

Cement Machinery.
The Canadian Fairbanks Co., Montreal
Gardner Robt & Son Montreal
National Mach. & Supply Co., Hamilton
Owen Sound Iron Works Co., Owen Sound.
Waterous Engine Works Co, Brantford

Centering Machines.
John Bertram & Sons Co., Dundas, Ont
Foss & Hill Machinery Co., Montreal
Gardner Robt & Son, Montreal
General Supply Co. of Canada, Ottawa
London Mach Tool Co, Hamilton, Ont.
Mussens, Limited, Montreal
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
Pratt & Whitney Co, Hartford, Conn.
Waterous Engine Works Co, Brantford.

Chain Blocks.
Rupert G Bruce Co., Ltd, Toronto
The Canadian Fairbanks Co., Montreal
Ford Chain Block Co., Philadelphia, Pa.
General Supply Co. of Canada, Ottawa
John Millen & Son, Montreal
Mussens Limited, Montreal
National Mach. & Supply Co. Hamilton
Schuchardt & Schutte, New York

Chucks, Drill, Lathe and Universal.
John Bertram & Sons Co., Dundas, Ont.
Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn
Foss & Hill Machinery Co., Montreal
Gardner Robt. & Son Montreal
General Supply Co of Canada, Ottawa
S. E. Horton Machine Co., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
National Mach. & Supply Co, Hamilton
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York
Standard Tool Co, Cleveland, O
Stevens Co., Galt, Ont.
Union Mfg. Co. New Britain, Conn.

Chucking Machines.
The Garvin Machine Co., New York
Niles-Bement-Pond Co., New York.
Springfield Machine Tool Co, Springfield, O.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Canadian Westinghouse Co., Hamilton.

Cloth and Wool Dryers.
Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Clutches.
Positive Clutch & Pulley Works, Toronto

Coal Boring and Cutting Machines.
Canadian Rand Co., Montreal

Coal Handling Machinery.
Browning Engineering Co., Cleveland, O.
Standard Engineering Co Toronto.
Waterous Engine Works Co., Brantford

Collectors, Pneumatic.
Sheldons Limited, Galt

Collets, Milling Machine.
The National Tool Co., Cleveland, O.

Compressors, Air.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

Concentrating Plant.
Gardner, Robt. & Son, Montreal

Concrete Mixers.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
General Supply Co of Canada, Ottawa
Mussens, Limited, Montreal
National Mach & Supply Co., Hamilton

Concrete, Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co, Hamilton
Steel and Radiation, Toronto

Condensers.
Goldie & McCulloch Co., Galt.
Hall Engineering Works Montreal.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co., Brantford.

Consulting Engineers.
Hall Engineering Works Montreal.
Robertson J. M., Ltd. Montreal
Standard Engineering Co., Toronto

Controllers and Starters Electric Motor.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.
The Canadian Fairbanks Co., Montreal
Canadian Matthews Gravity Carrier Co., Toronto
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt
Mussens Limited, Montreal.
National Mach. & Supply Co, Hamilton
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach Tool Co., Hamilton
Nation l Mach. & Sup ly Co., Hamilton
Niles-Bement-Pond Co. New York.

Counterbores and Countersinks.
Clev land Tw st Dril Co Cleveland
Ge eral Supply o. of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O.
Standard Tool Co., Cleveland, O

Couplings.
Gardner Robt. & Son Montreal
Noon Universa Coupler Co., Toronto
Owen Sound Iron Works Co., Owen Sound

Couplings, Air Hose.
Canadian Rand Co , M ntreal.
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago

Cranes, Locomotive.
Browning Engineering Co., Cleveland, O
Mussens, Li ited, Montreal

Cranes, Traveling, Electric and Hand Power.
Advance Machine Works Walkerville, Ontario
International Marine Signal Co., Ottawa
Mussens, Limited, Montreal
Northern Eng. Works, Detroit, U.S.A.
Royce, Ltd., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Wrecking.
Browning Engineering Co. Cleveland

Crank Pin Turning Machine.
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crossings, Diamond Rail.
Canadian Steel Foundries, Montreal

Crushers, Rock or Ore.
Foss & Hill Machinery Co., Montreal
Mussens, Limited, Montreal
Waterous Engine Works Co., Brantford.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago Ill.

Cutters, Pipe.
The Canadian Fairbanks Co., Montreal
A B Jardine & Co., Hespeler, Ont.
Trimont Mfg. Co. Roxbury, Mass.

Cutter Grinders and Attachments
Cincinnati Milling Machine Co., Cincinnati
Garvin Machine Co., New York
General Supply Co of Canada, Ottawa
Modern Tool Co., Erie, Pa.
Mussens, Limited, Montreal

Cutters, Milling.
Becker Milling Machine Co., Hyde Park Mass
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
General Supply Co of Canada, Ottawa
Morse Twist Drill and Machine Co. New Bedford
Mussens Limited, Montreal.
National Tool Co., Cleveland, O.
Pratt & Whitney Co. Hartford, Conn.
Standard Tool Co., Cleveland O

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co. Dundas, Ont.
The Canadian Fairbanks Co., Montreal
W. P. Davis Machine Co., Rochester, N.Y
Garvin Machine Co , New York
General Supply Co. of Canada, Ottawa
Joshua Heap & Co., Ltd., Ashton-under-Lyne Eng
London Mach Tool Co., Hamilton.
Mussens Limited Montreal.
National Tool Co., Cleveland O.
Pratt & Whitney Co. Hartford, Conn.
L. S. Starrett Co Athol Mass.

Cutting Compounds.
Acheson Oildag Co., Sarnia, Ont.

Damper Regulators.
The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal
Standard Engineering Co., Toronto.

Dies and Die Stocks.
Armstrong Bros., Toronto
Banfield, W H & Son, Toronto
Foss & Hill Machinery Co., Montreal
Gardner, Robt. & Son, Montreal
General Supply Co. of Canada, Ottawa
Holden Morgan Co. Toronto
Jardine, A. B. & Co., Hespeler Ont.
Morse Twist Drill and Machine Co , New Bedford
Russell Machine Co., St. Catharines, Ont
Ernest Scott, Montreal

Die Castings.
Tallman Brass & Metal Co., Hamilton

Die Linkers.
Garvin Machine Co New York

Dies, Self-opening.
Geometric ool Co., New Haven, Conn.

Dies, Opening.
W. H. Banfield & Sons, Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Sheet Metal Working
E. W. Bliss Co., B ooklyn N.Y.

Draft, Mechanical.
W. H. Banneid & Sons, Toronto.
Butterfield & Co. Rock Island, Que.
A B. Jardine & Co Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Dredging Machinery.
Browning Engineering Co., Cleveland
Mussens, Limited, Montreal

Drift Bolt Cutters.
Cleveland Pneumatic Tool Co., Cleveland

Drill Presses.
W. F. & John Barnes Co , Rockford, Ill.
Foss & Hill Machinery Co. Montreal.
Garvin Machine Co. New York
General Supply Co. of Canada, Ottawa
Mussens, Limited, Montreal

Drilling Machines, Locomotive and Multiple Spindle.
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Pulley Machinery Co., Cincinnati, O.
Drummond Bros., Ryde's Hill, Eng
Garvin Machine Co. New York
General Supply Co of Canada, Ottawa
London Mach. Tool Co., Hamilton, Ont.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.
John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal
Drummond Bros. Ryde's Hil , Eng
Foss & Hill Machinery Co., Montreal
General Supply Co of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mueller Machine Tool Co., Cincinnati, O.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.
Taylor & Fenn Co., Hartford, Conn

Drilling Machines, Sensitive.
W. F. & John Barnes Co., Rockford, Ill.
H. G Barr, Worcester, Mass.
Cincinnati Pulley Machinery Co., Cincinnati
Drummond Bros., Ryde's Hill, Eng
General Supply Co of Canada, Ottawa
D. McKenzie, Guelph, Ont.
Mussens Limited Montreal
Niles-Bement-Pond Co., New York
Taylor & Fenn Co., Hartford, Conn

Drilling Machines, Upright and Horizontal.
W. F & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas, Ont
W. P. Davis Machine Co., Rochester, N.Y
Drummond Bros , Ryde's Hill, Eng
Foss & Hill Machinery Co , Montreal
Gem Mfg. Co , Pittsburg, Pa
A. B. Jardine & Co , Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
R. McDougall Co., Galt
Niles-Bement-Pond Co., New York
Springfield Machine Tool Co., Springfield O.

Drills, Bench.
W. F. & John Barnes Co., Rockford, Ill.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn
United States Electrical Tool Co., Cincinnati

Drills, Blacksmith and Bit Stock.
Cleveland Twist Drill Co , Cleveland
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Centre.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co , Cleveland, O
L. S. Starrett Co., Athol, Mass
Whitman & Barnes Mfg. Co , St. Catharines, Ont

Drills, Coal and Plaster.
Canadian Rand Co., Montreal
Cumming J. W., New Glasgow. N.S.

Drills, Corner (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland

Drills, Electric and Portable.
General Supply Co of Canada, Ottawa
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
United States Electrical Tool Co., Cincinnati

Drills, High Speed.
W. F. & John Barnes Co., Rockford, Ill.
Hermann Boker & Co. ontreal
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co , Cleveland
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn
Sibley Machine Tool Co., South Pend, Ind.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland
General Supply Co of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Pneumatic.
John F. Allen Co., New York
Canadian Rand Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co , Chicago.
The Canadian Fairbanks Co , Montreal
Cleveland Twist Drill Co Cleveland
A. B. Jardine & Co., Hespeler
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Chas. Parker & Co., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg Co , St Catharines, Ont

Drills, Rock.
Canadian Rand Co., Montreal.
Mussens, Limited, Montreal

Drills, Track.
Cleveland Twist Drill Co., Cleveland
General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Standard Tool Co , Cleveland O
Whitman & Barnes Mfg. Co., St. Catharines Ont

Drills, Twist.
The Canadian Fairbanks Co., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Morse Twist Drill and Machine Co. New Bedford, Mass.
Mussens Limited Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drill Sockets.
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Dry Kiln Cars and Equipment.
Sheldons Limited, Galt

Dump Cars.
Rupert G. Bruce Co., Ltd., Toronto
Browning Engineering Co , Cleveland
The Canadian Fairbanks Co., Montreal
General Supply Co. of Canada, Ottawa
Francis Hyde & Co Montreal.
Mussens Limited Montreal
National Mach & Supply Co , Hamilton
Niles-Bement-Pond Co , New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dynamos and Electrical Supplies.
The Canadian Fairbanks Co , Montreal
Canadian Westinghouse Co., Hamilton.
Federal Eng. & Supplies, Ltd., Toronto
Hall Engineering Works, Montreal, Que.
Lancashire Dynamo and Motor Co., Ltd., Toronto
T. & H. Electric Co., Hamilton

Electric Welding.
Standard Welding Co., Cleveland, O.

Elevating Machinery
Canadian Matthews Gravity Carrier Co., Toronto

Elevators and Buckets.
Francis Hyde & Co Montreal.
Waterous Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill

Emery Grinders (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland

Emery and Emery Wheels.
The Canadian Fairbanks Co., Montreal
Canadian Hart Wheels Ltd , Hamilton.
Garvin Machine Co., New York
Foss & Hill Machinery Co., Montreal
Francis Hyde & Co., Montreal
Mussens, Limited Montreal
Pittsburg Emery Wheel Co., Pittsburg Pa
Stevens & B., Detroit Mich.

Emery Wheels, Dressers and Stands.
Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Gardner, Robt & Son Montreal
Francis Hyde & Co., Montreal.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton

Engineers, Marine and Mechanical.
Canadian General & Shoe Machinery Co. Levis, Que.

Engines, Marine.
The "Swift" Motor Car Co. of Canada Ltd , Chatham

Engineers' Supplies.
Hall Engineering Works Montreal.

Engines, Gas and Gasolene.
The Canadian Fairbanks Co., Montreal
Fielding & Platt, Ltd., Gloucester, Eng.
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt, Ont.
Jones & Glass Co Montreal
National Mach. & Supply Co. Hamilton
The "Swift" Motor Car Co. of Canada Ltd., Chatham

Engines, Steam.
General Supply Co. of Canada, Ottawa.
The Goldie & McCulloch Co., Galt, Ont
Robb Engineering Co., Amherst. N S.
National Mach. & Supply Co., Hamilton
Scotia Eng. Co., Montreal
Sheldons Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Equipment, Shop
Garvin Machine Co , New York

Escutcheon Pins.
Parmenter & Bulloch Co Gananoque

Exhaust Heads.
The Canadian Fairbanks Co., Montreal
Darling Bros , Ltd. Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co , Toronto.

Exhausters
Can. Buffalo Forge Co., Montreal

Expanded Metal.
Steel & Radiation Ltd , Toronto

Experimental Work
Holden-Morgan Co., Toronto

Fans, Electric.
Canadian Westinghouse Co., Hamilton
Foss & Hill Machinery Co , Montreal
Matthews & Yates, Manchester Eng.
Sheldons Limited Galt Ont
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.
The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
General Supply Co. of Canada, Ottawa
Robb Engineering Co., Amherst N.S.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co , Toronto.
Waterous Engine Works Co., Brantford.

Files.
General Supply Co. of Canada, Ottawa
Nicholson File Co , Port Hope, Ont.
Simonds Mfg. Co., Fitchburg Mass.

Flanges.
Dart Union Co., Ltd., Toronto

Forges.
Francis Hyde & Co., Montreal.
Independent Pneumatic Tool Co. Chicago, Ill.
National Mach. & Supply Co., Hamilton
W. S. Rockwell Co., New York
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.
Francis Hyde & Co., Montreal.
W. S. Rockwell Co., New York

Forgings, Drop, Automobile and Locomotive.
Bliss, E. W., Co , Brooklyn N Y.
Canadian Billings & Spencer, Ltd., Welland

Forging Hammers, Pneumatic
E. W. Bliss, Co., Brooklyn, N.Y.

Forging Machinery.
John Bertram & Sons Co , Dundas, Ont.
Bliss, E. W., Co , Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co . New York.
Standard Engineering Co , Toronto

Friction Clutch Pulleys, etc.
The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs.
Canadian Steel Foundries, Montreal

Furnaces, Steel Heating.
Standard Engineering Co , Toronto
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.
Sheldons Limited, Galt.

Gas Producer Linings.
Harbison-Walker Refractories Co., Pittsburg

Gas Producer Plants.
The Canadian Fairbanks Co., Montreal
Fielding & Platt Ltd., Gloucester, Eng

Gauges, Standard.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co , Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co., Hartford, Conn

Gear-Cutting Machinery.
The Canadian Fairbanks Co , Montreal
Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens, Limited, Montreal
Morse Twist Drill and Machine Co., New Bedford
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co , New York.
Pratt & Whitney Co., Hartford. Conn.
Schuchardt & Schutte, New York

Gears, Cut, Mortise, Angle Worm
Armstrong Bros., Toronto

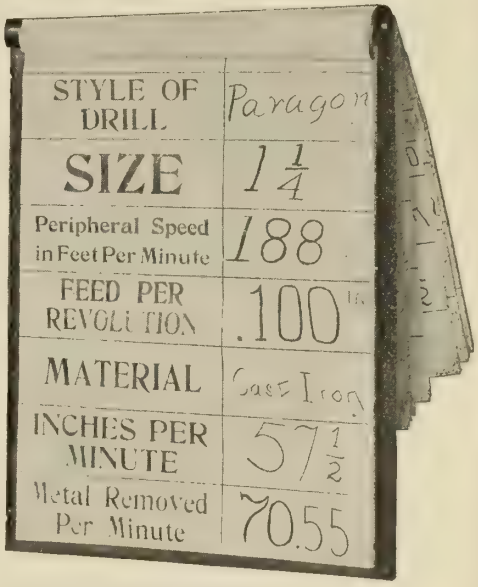
CLEVELAND

MAKES WORLD'S DRILLING RECORD

At the June Convention of the Railway Master Mechanics and Master Car Builders Associations at Atlantic City, the highest point in drilling efficiency that machine shop practice has ever known was attained by a stock 1 1/4" Paragon Flatwist High Speed Drill in successfully removing 70.55 cubic inches of cast iron in one minute, repeatedly cutting through a heavy billet at the record-breaking rate of

57½ Inches—Almost 5 Feet—Per Minute

This 1 1/4" drill ran at 575 revolutions per minute with 1/10 (.100) inch feed per revolution, successfully withstanding the terrific strain of this extreme speed and feed. Before attaining this maximum performance, which was approached gradually, numerous other "Cleveland" Drills were put through at the rates of 33, 35 and 47 1/2 inches per minute. In no case was the limit of strength of the drills reached, but the speed of 57 1/2 inches per minute could not be exceeded on account of the inadequate capacity of the electric feed wires which brought current to the motor driving the drill press.



Facsimile of the bulletin which gave the first detailed announcement of the results to the numerous interested spectators.

There can be but One Logical Conclusion That Will Interest the User of Drills—"Cleveland" Materials — "Cleveland" Workmanship — "Cleveland" Heat Treatment—**Must be right.**

Although drilling at such a speed is not to be recommended as economical shop practice, and can only be accomplished under ideal conditions, such as—absolute rigidity in the machine, uniform and sufficient driving power, solid clamping of the work, perfect grinding of the tool, and the most expert handling—yet this extremely severe test proves conclusively the unequaled durability and reserve efficiency of "Cleveland" Twist Drills.

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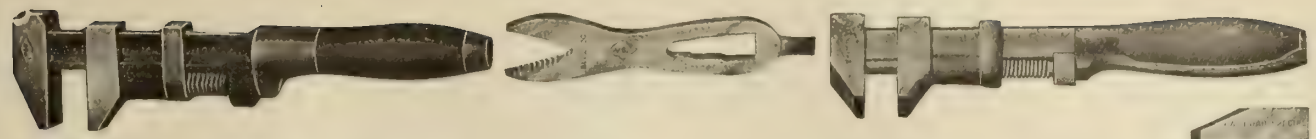
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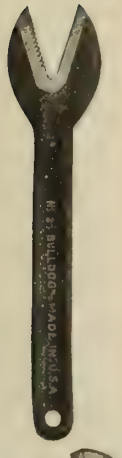




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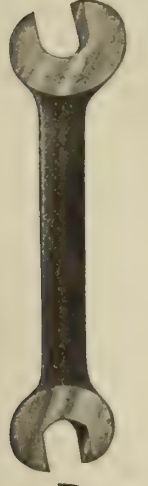


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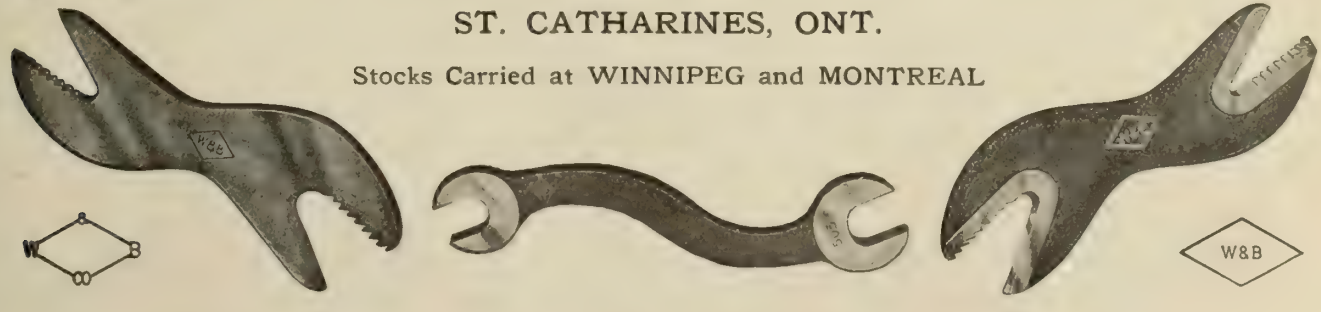
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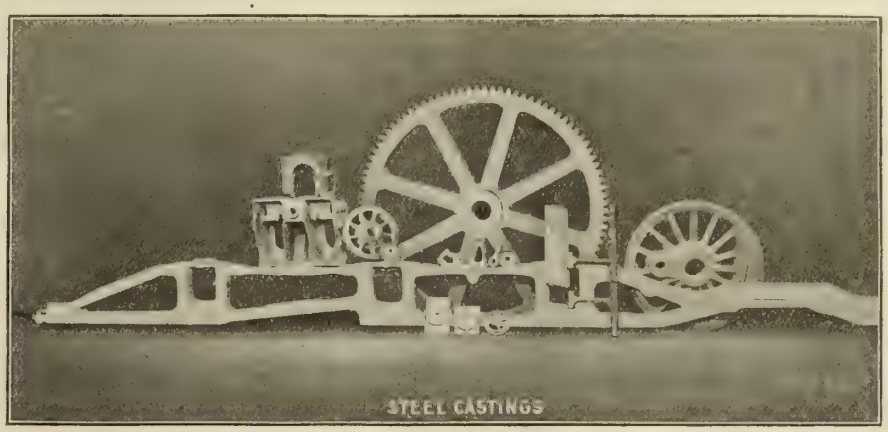
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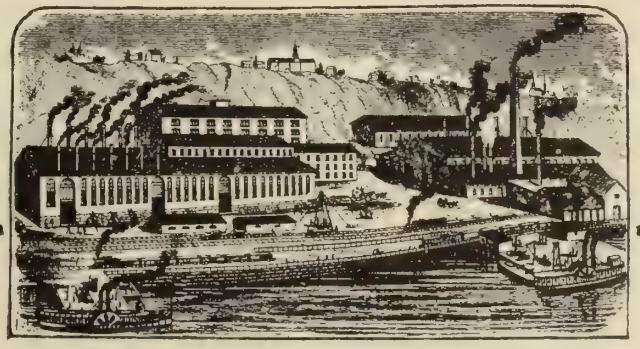
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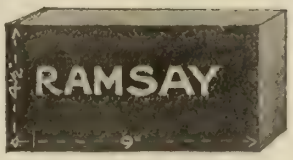
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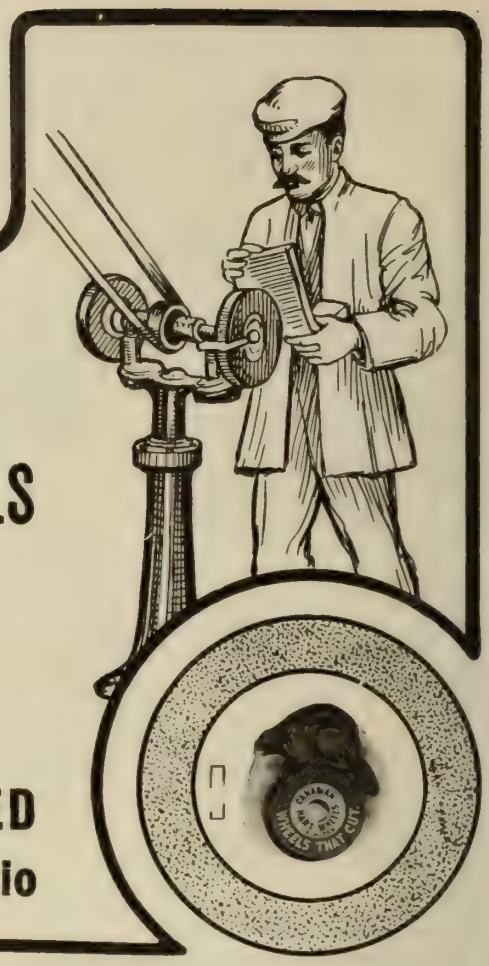
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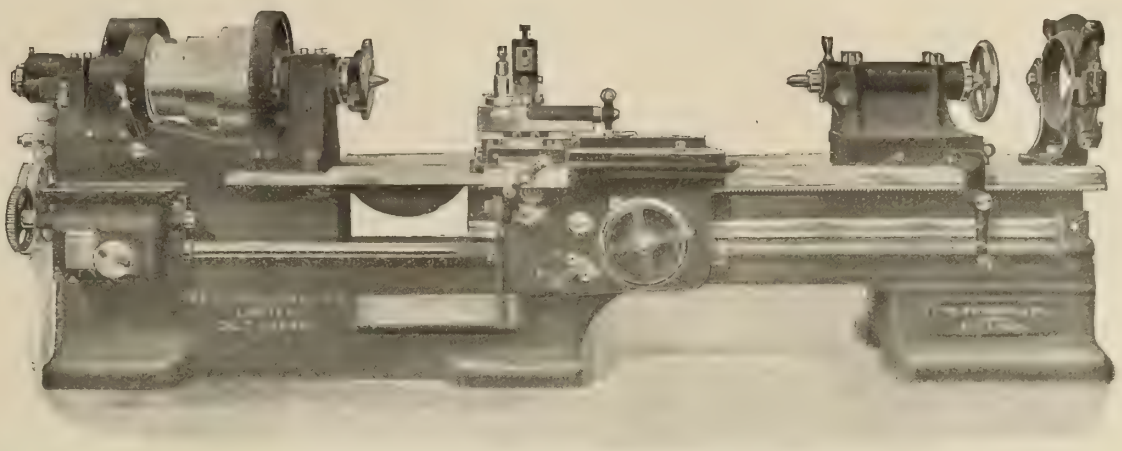
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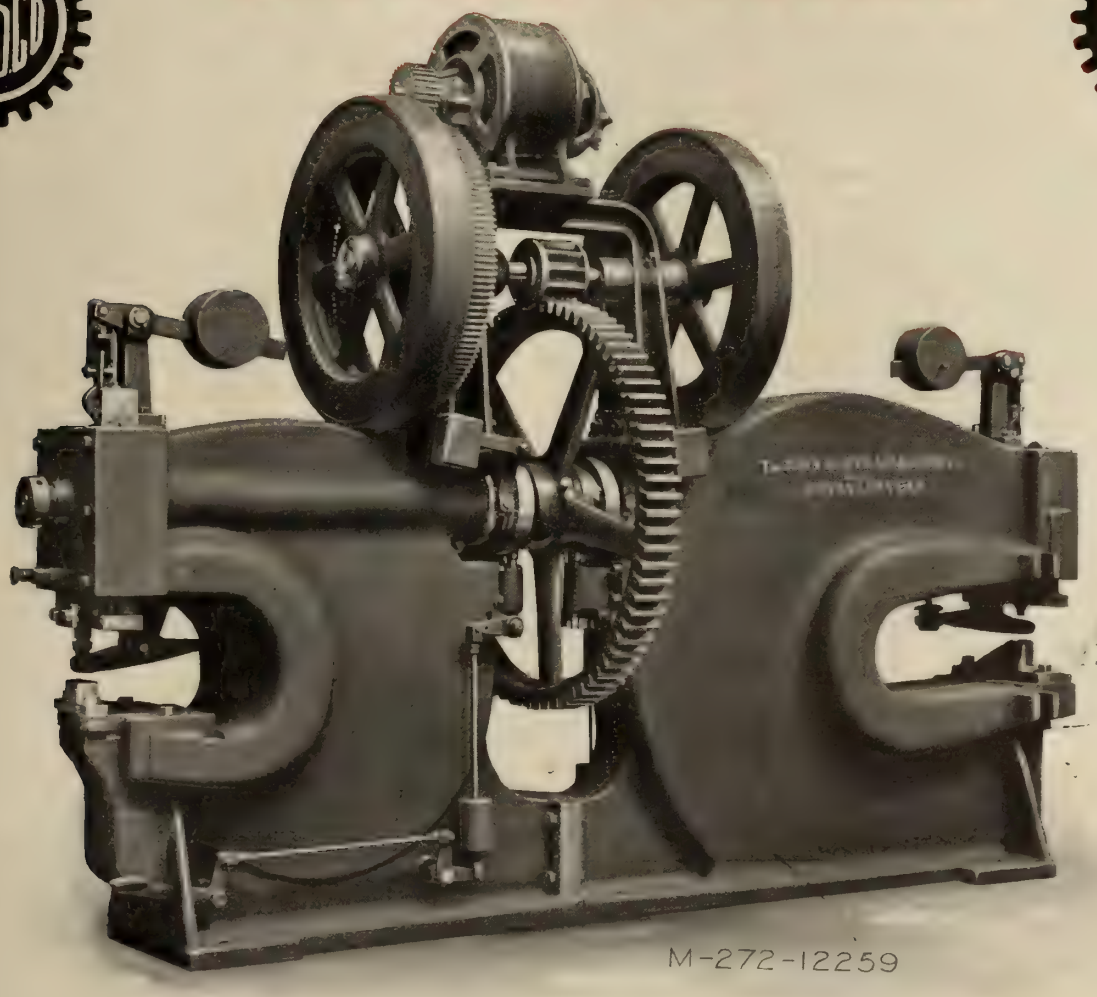
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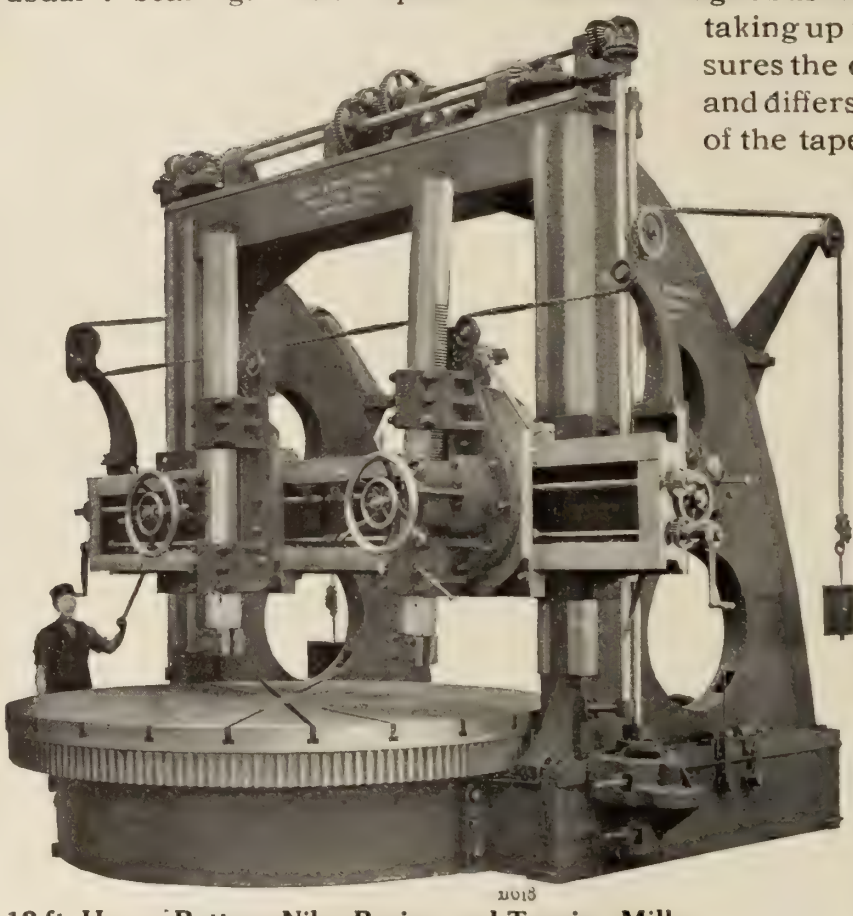
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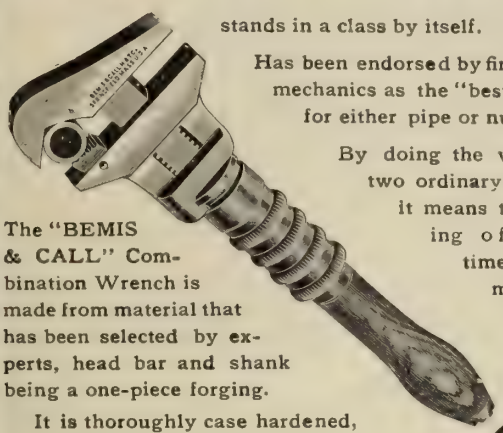
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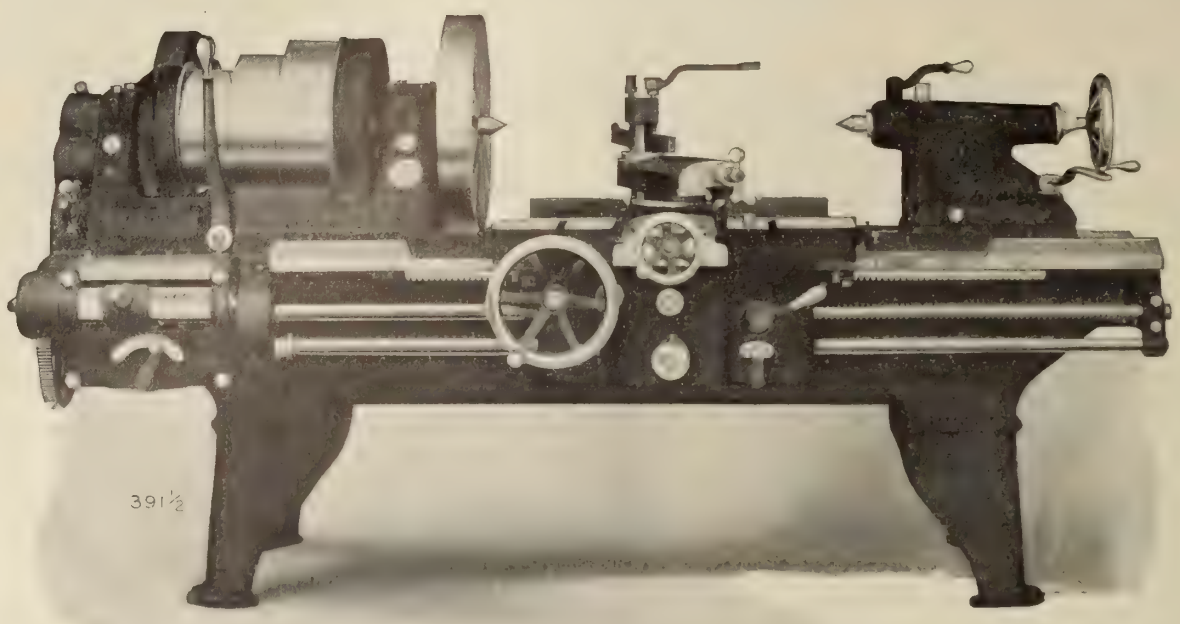


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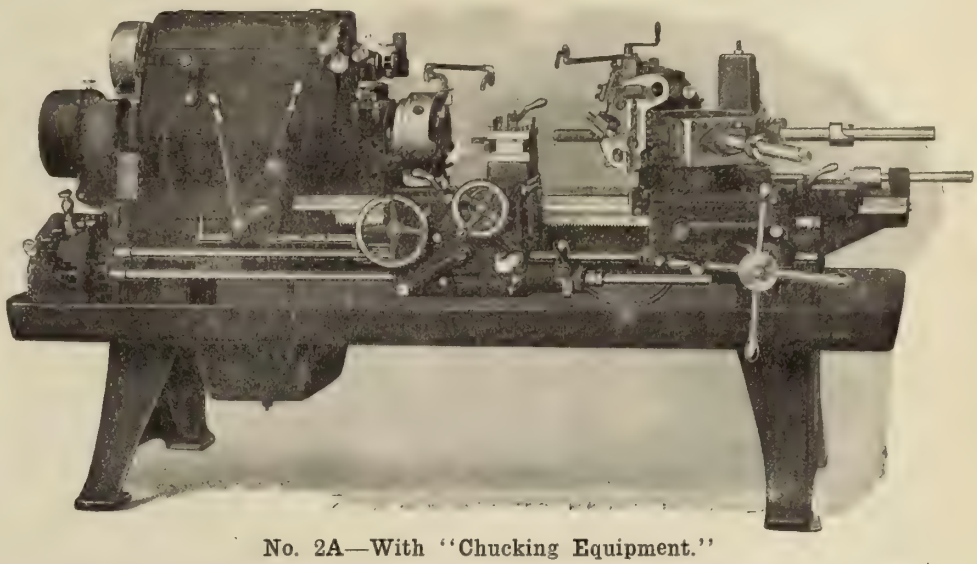
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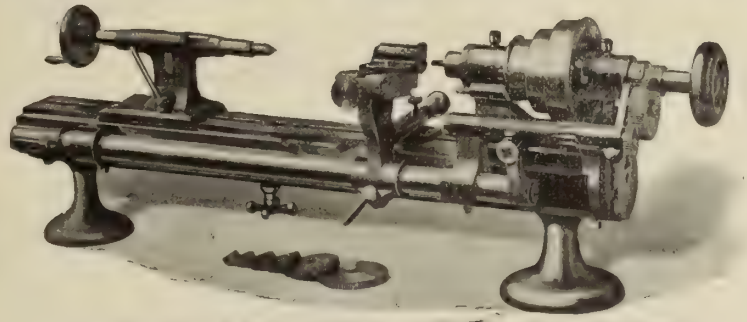
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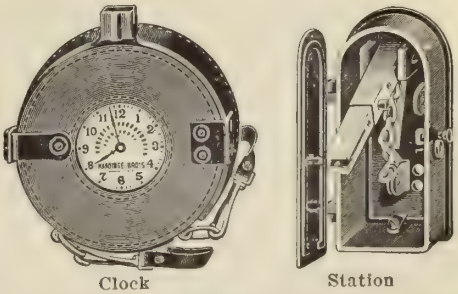
TURRET LATHES—TURRET SCREW MACHINES—BRASS-WORKING MACHINE TOOLS

Canadian Agents: A. R. Williams Machinery Co., Toronto, and Williams & Wilson, Montreal

THE HARDINGE LINE

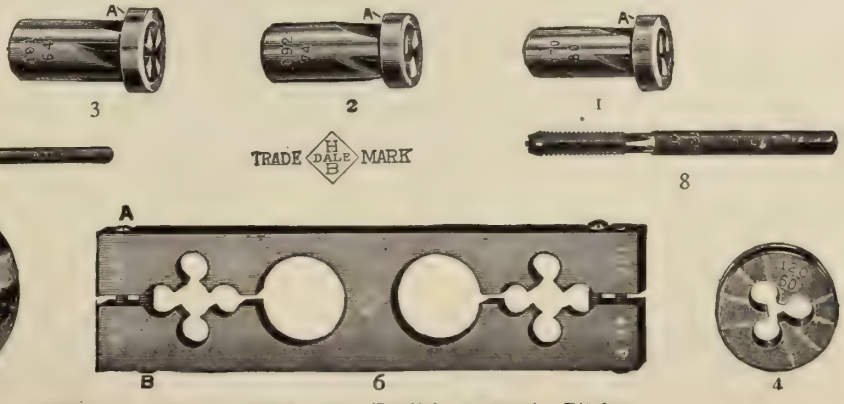


Hardinge No. 3 Bench Lathe, showing Chasing Attachment.



Clock Station

Beyer Watchman's Clock for Factories, Lumber Yards or Town Patrol.



Taps and Dies of special sizes, English or Metric Pitches.

Write for Catalogs

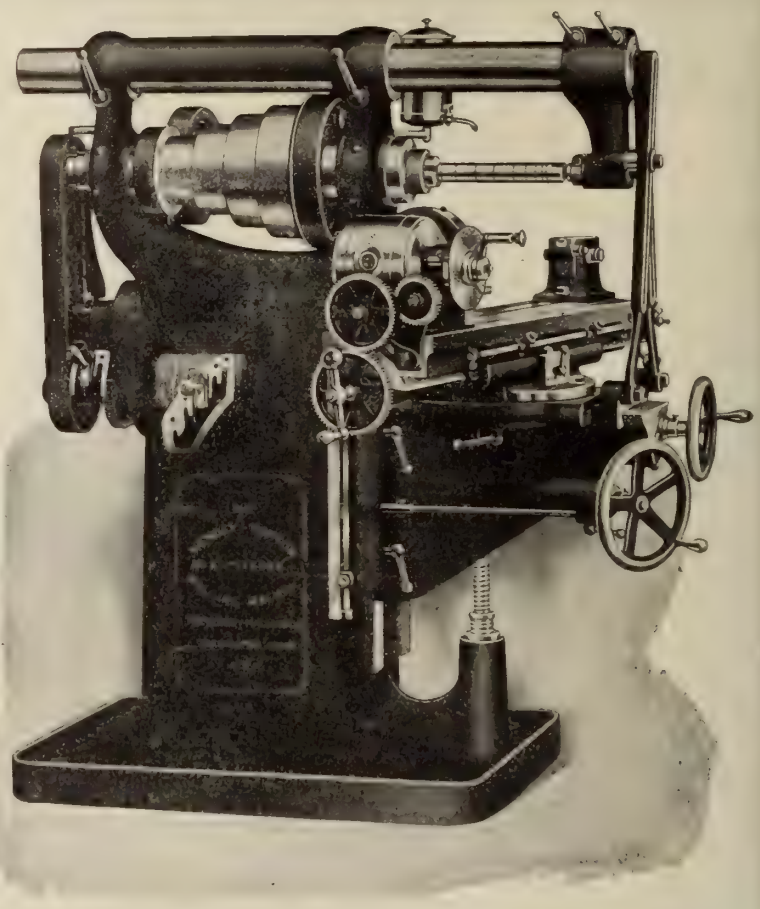
Hardinge Bros. Inc.

3133-3141 Lincoln Ave.
CHICAGO, ILL.

Canadian Agents:
The A. R. Williams Machinery Co., Limited
Toronto, Montreal, Winnipeg, Vancouver and St. John, N.B.

HENDEY UNIVERSAL MILLING MACHINE

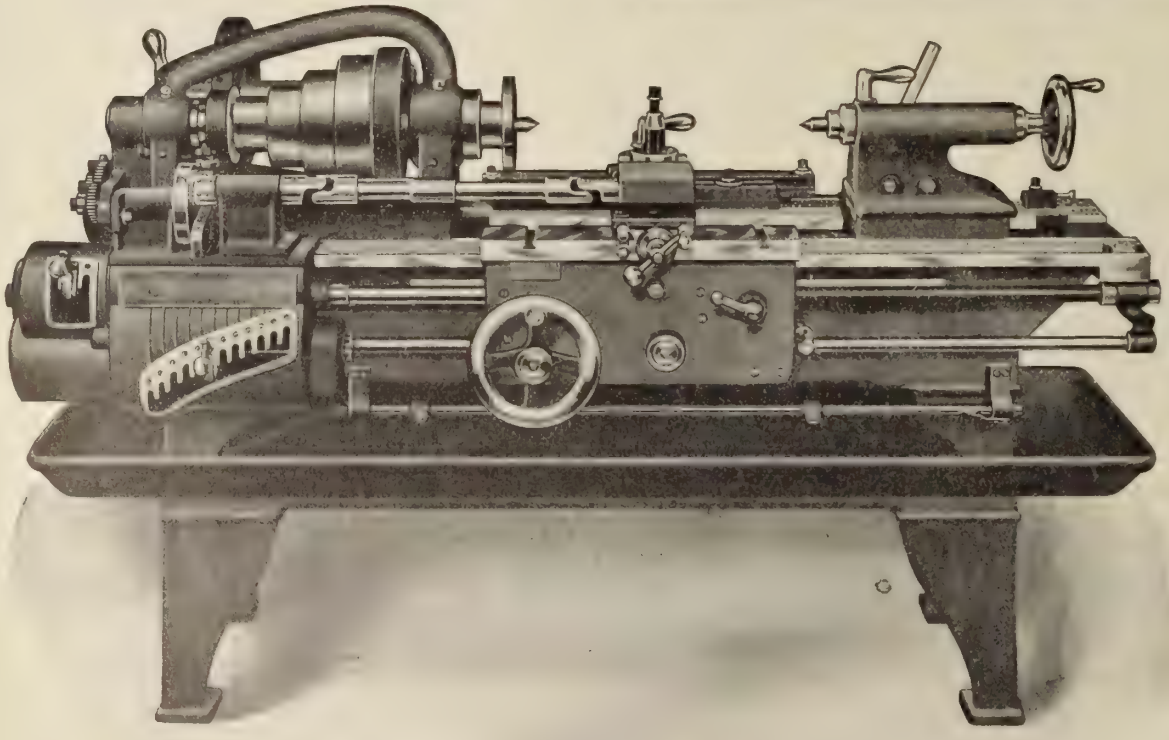
To take care of the work in your tool room, we can supply you with Universal Milling Machines, of which a suitable size is this No. 2.



And Lathes, such as this

HENDEY 16-INCH SWING LATHE

mounted in oil pan and fitted with Taper and Relieving Attachments, the latter for backing off the teeth of Taps, Cutters, etc., with mechanical precision. Watch Tool Chucks are also offered in sets from ½ to ⅞ by 16ths, making the Lathe very complete for handling a wide variety of work.



Both these Machines are more fully described in our Complete Catalogue, which we will be glad to mail you.

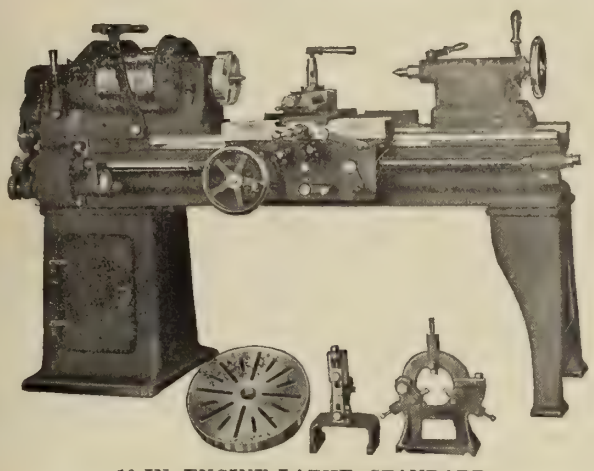
The Hendey Machine Co.
Torrington, Conn., U.S.A.

Canadian Agents: A. R. Williams Machinery Co , Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal, Canada; General Supply Co. of Canada, Ottawa, Ont.

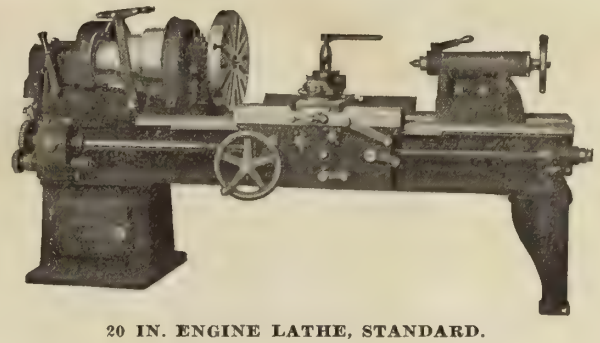
The advertiser would like to know where you saw his advertisement—tell him.

CANADA MACHINERY CORPORATION, LIMITED

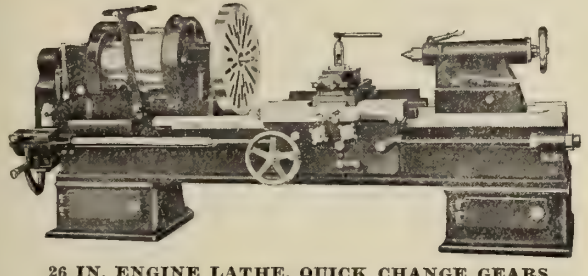
LATHES—LATHES—LATHES



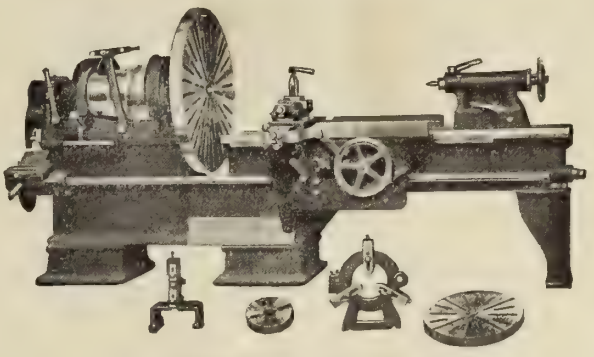
16 IN. ENGINE LATHE, STANDARD.



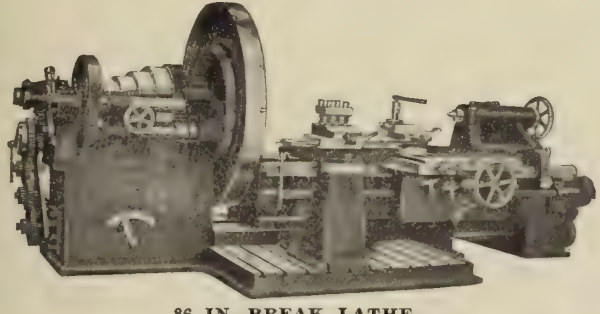
20 IN. ENGINE LATHE, STANDARD.



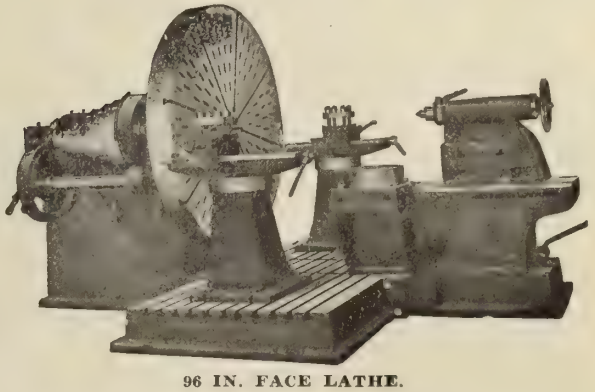
26 IN. ENGINE LATHE, QUICK CHANGE GEARS.



GAP LATHE, QUICK CHANGE GEARS.



86 IN. BREAK LATHE.



96 IN. FACE LATHE.

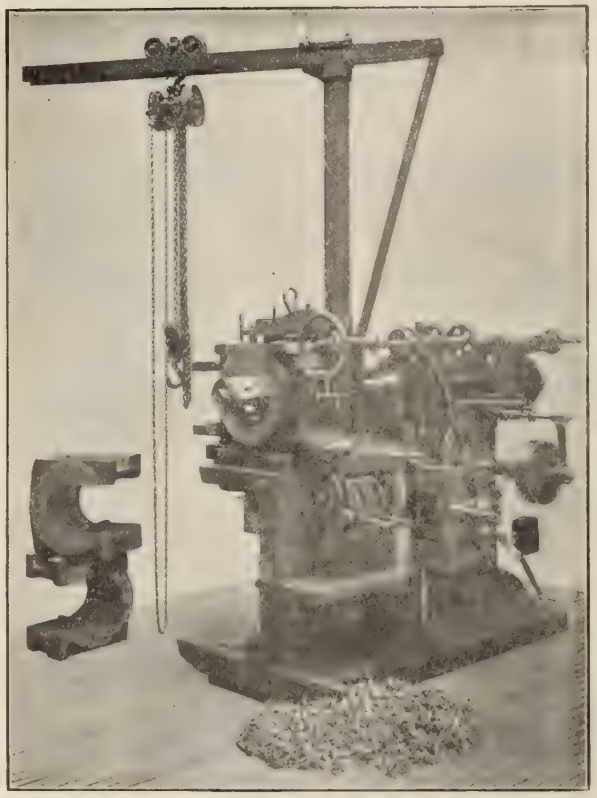
OUR LINE ALSO INCLUDES SHAPERS, PLANERS, PUNCHES AND SHEARS, DRILLS, SLOTTERS, BULL-DOZERS, DROP AND HELVE HAMMERS.

Catalogue and prices on application.

Canada Machinery Corporation, Limited

GALT, ONTARIO

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1½ to 6 inch pipe; Bolts ½ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2"; ½" to 3"; 1" to 4"; 1½" o 6"; 2" to 8" and 3½" to 12".

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

Sold by the

A. R. Williams Machinery Co., Limited

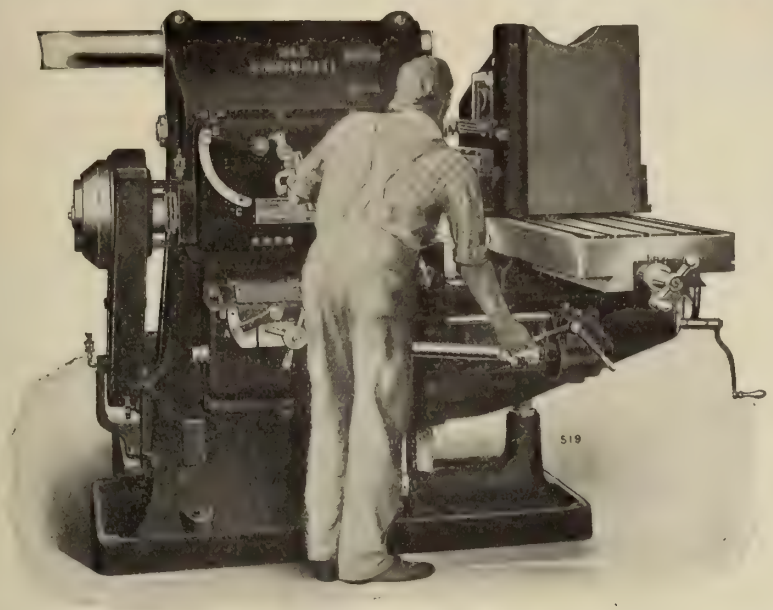
Toronto Montreal St. John Vancouver and Winnipeg

Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

Cincinnati Handiness



WHEN you have a job of end or face milling to do on a Horizontal Miller, don't you find it hard to operate the feed lever and at the same time keep your eye on the cutter? That's because the machines you are using can be operated from only one place. Our new High Power Machines have an additional feed lever at the side of the knee.

The operator can stand close up to his work, with the cutter in full view, and control the machine from this position.

With this one lever he can operate and reverse table, cross or vertical feeds.

The main starting lever is immediately in front of him and the speed and feed changers are at his elbow, so that the entire machine is under complete control from here.

ASK FOR THE CATALOG.

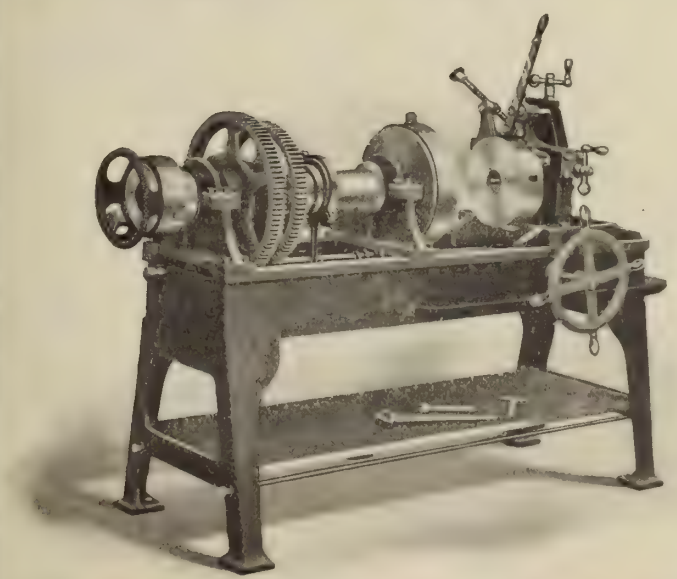
The Cincinnati Milling Machine Company

MILLING SPECIALISTS

CINCINNATI, OHIO, U.S.A.

Canadian Agent—H. W. PETRIE, Limited, Toronto, Montreal and Vancouver.

Nothing Lacking in a B. & K. Pipe Machine



And not a single useless or complicated accessory in the whole make-up. The Bignall & Keeler line of machines is built for rapid, accurate and economical pipe cutting and threading. They are designed for this work, up-to-date, adapted for varying needs and fitted accordingly. If a certain machine needs **two** gripping chucks for the most advantageous operation —we put on two chucks. If but **one** is needed, it's a case of one. If a motor drive is desired the motor can be easily mounted and attached. The dies, gripping chucks, etc., used in B. & K. machines are of the most approved types, and strength and durability are conspicuous features.

Write for catalogue—our line is very complete.

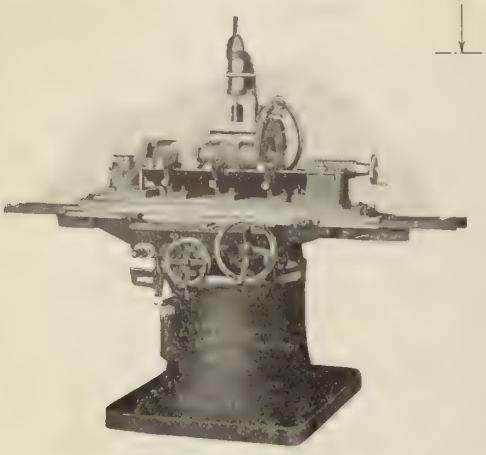
BIGNALL & KEELER MFG. COMPANY

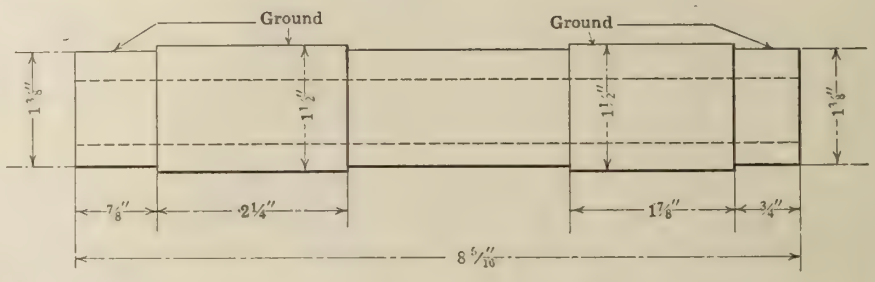
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Selling Agents for Canada—Canadian Fairbanks Co., Ltd., Montreal, Toronto, St. John, N.B., Winnipeg, Calgary, Vancouver

Work Done on a 10x25 Bath Cylindrical Grinder

Cast Iron. Stocked removed, .012. Limit, .00025. Time = 10 minutes. Four diameters





Compare the time on this work with what you are able to obtain with your present equipment and method. Bath Grinders show astonishing results and guarantee remarkable savings. Let us tell you what we can accomplish on your work.

The Bath Grinder Company, Inc., Fitchburg, Mass., U.S.A.

POWER PUNCHING AND SHEARING MACHINERY

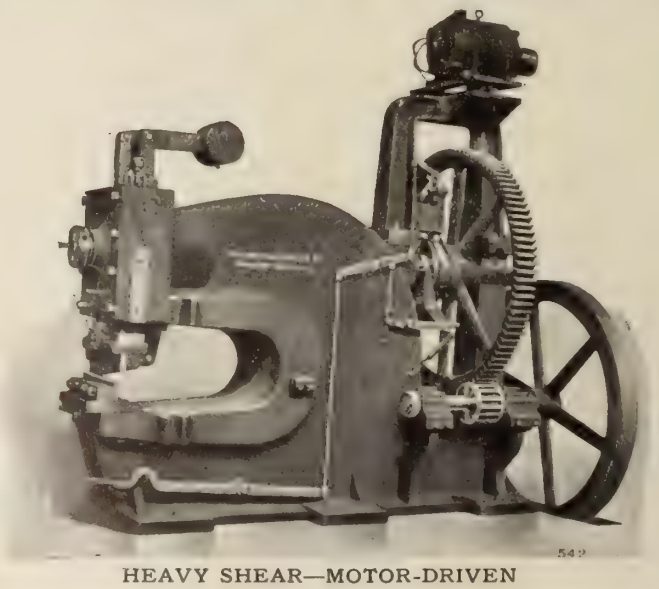
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications.



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

Tire Bending Rolls.

Bending and Forming Machines.

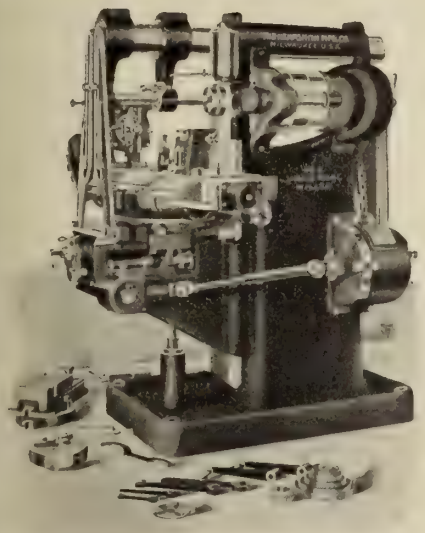
Drop and Helve Hammers, Etc., Etc.

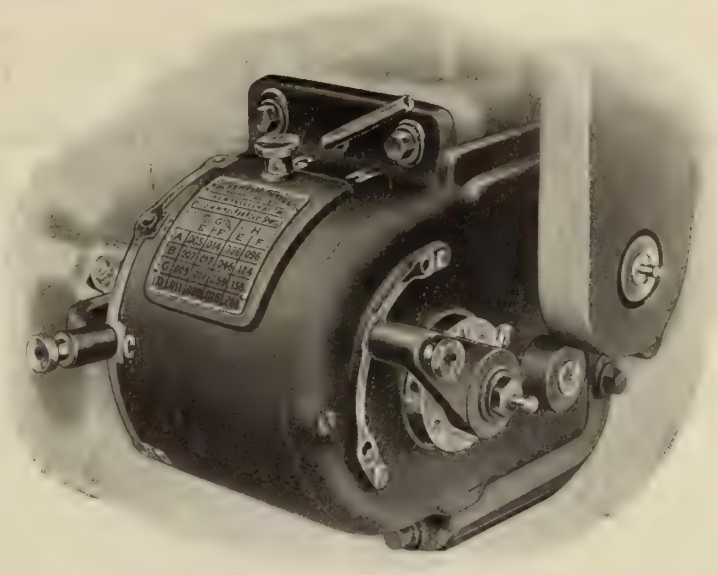
Designed and Manufactured by

THE LONG & ALLSTATTER CO.

Hamilton, Ohio, U.S.A.

The every-day operation of the milling machine depends much on the character of the feed-changing and feed-tripping mechanism, and the table operative features.



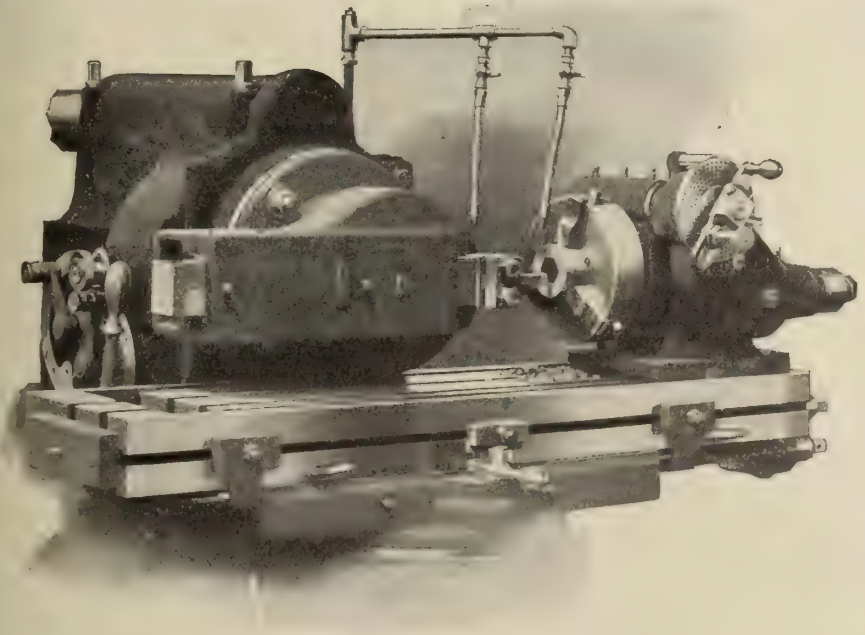


The high development of these on

KEMPSMITH
MILLING MACHINES

is an indication of their general excellence.

The KEMPSMITH MFG. COMPANY, Milwaukee, Wis.



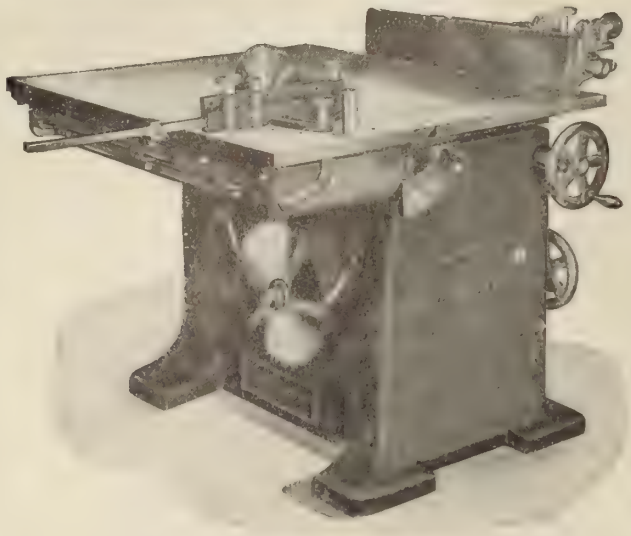
EVERY tool room should have a Milwaukee Universal Milling Machine, every universal milling machine should have a slotting attachment and every tool room foreman should have our latest book—to be had for the asking.

KEARNEY & TRECKER CO.

MANUFACTURERS MILWAUKEE, WIS.

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WILLIAMS & WILSON, Limited, Montreal

HAVE YOU EVER SEEN A NO. 205?



No. 205. Double Circular Saw.
Patented Jan. 26, 1908.

If you did, you know it's the finest saw ever built for pattern shops.

There is so much to tell about this machine that we have gotten up a special booklet about it. You are entitled to a copy and it will be sent upon receipt of your name and address.

Built like a machine tool throughout, but in such large lots that the price is right.

Don't forget to write for the book.

J. A. FAY & EGAN CO. 362-382 W. FRONT STREET, CINCINNATI, - OHIO.

Save On The Single Piece As Well As The Big Job

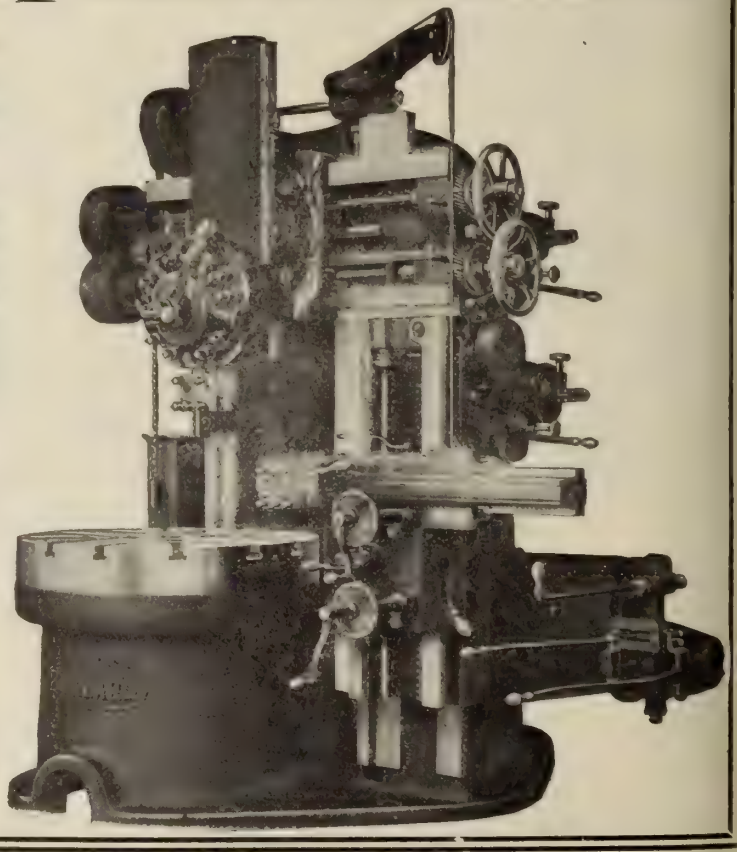
The Bullard Vertical Turret Lathe is not alone a manufacturing machine—the very features which make it a good manufacturing machine also reduce the cost of the individual piece.

The Vertical Turret Lathe is ready to save on face plate work of every description within its capacity. Vertical Construction, Ample Power and Rigidity, Multi-Cutting, Quick Speed Change, Centralized Control, Automatic Lubrication these cost-reducing factors save on the single piece as well as on the big job. It does not keep the foreman on the jump looking for the right job. Nor does it require an expensive special tool equipment for each job.

Investigate. Find out how much less YOUR face plate work will cost done on a Vertical Turret Lathe.

We'll be glad to put some interesting facts and figures before you.

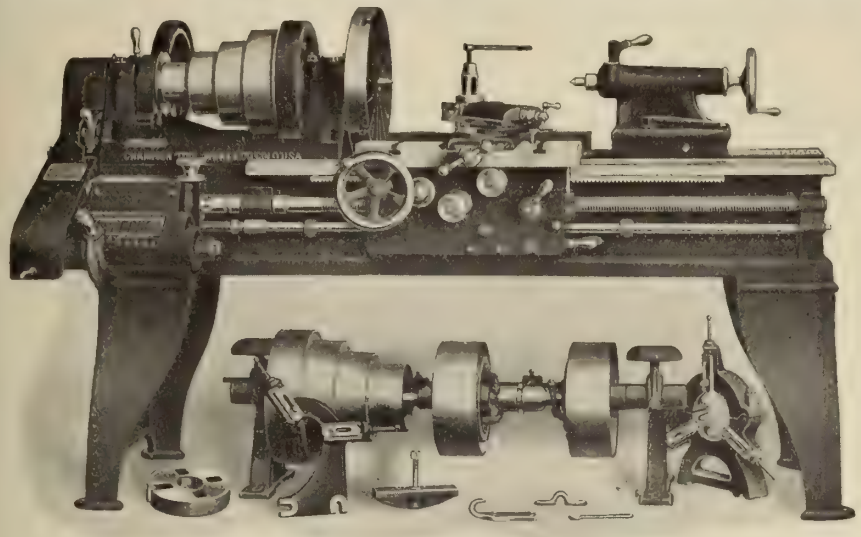
Send for Treatise on Face Plate Work, No. C-15, NOW.



The Bullard Machine Tool Co.

BRIDGEPORT, CONN., U.S.A.

You'll Want to do a Lot of Fine Work in Your Tool Room



16-in Quick Change Lathe.

And you will be able to do it if you USE A

CHAMPION LATHE

In addition to the very accurate work which can be done on our Lathes, there are the many simplified conveniences such as the Quick Change of Feeds or Threads, Threading Dial, Automatic Stop to the Feeds, Removable Rack Pinion, Apron Feed Reverse, Plunger Pin for Locking Head Cone, Gears all covered, Graduated Cross and Compound Feeds, and numerous other features which go to make up a fast and accurate tool. These Lathes furnished with or without Taper, Draw-in Attachments, Oil Pan, etc.

10, 12, 14, 16 and 18 INCH SIZES.

CHAMPION TOOL WORKS COMPANY

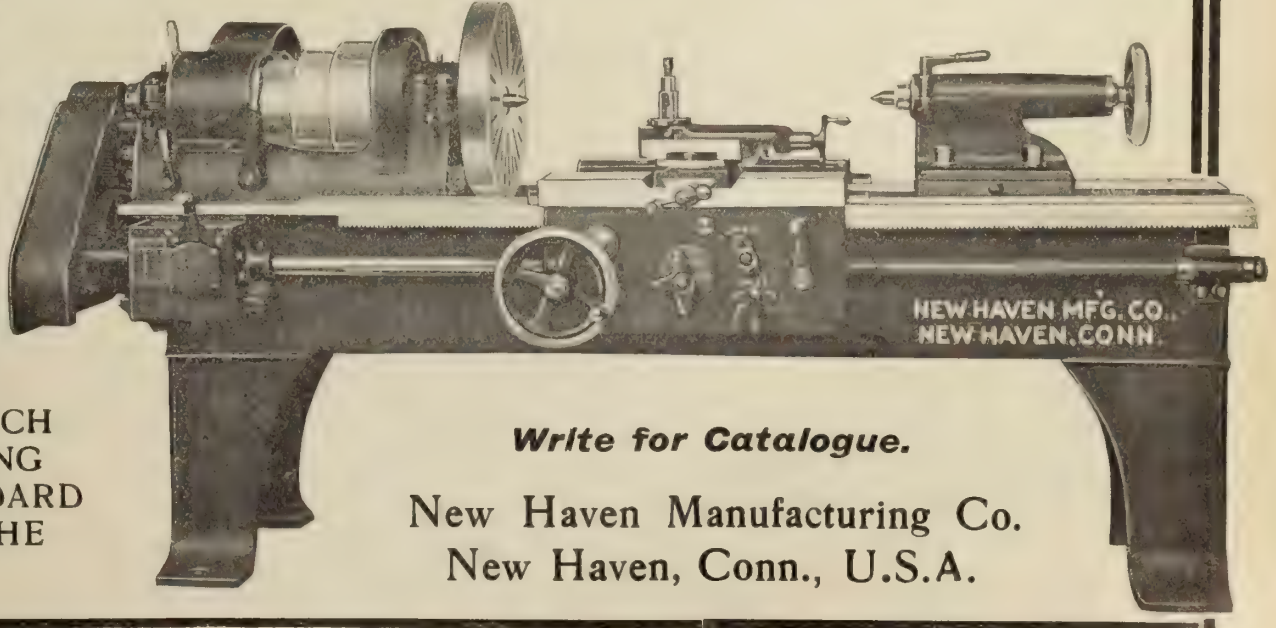
Station "B" CINCINNATI, OHIO, U.S.A.

NEW HAVEN LATHES

ARE THE MOST RELIABLE FOR CONSTANT SERVICE

These Lathes are furnished with beds from 8 to 20 ft. long, varying by two feet. We usually have in stock for prompt delivery Lathes with 8 to 16 ft. beds. Beds are strongly braced, and are cut through at the rear so that the tailstock can be removed by sliding off the end. Machines are inspected and thoroughly tested before leaving our works.

Regular equipment includes complete friction countershaft with self-oiling boxes, centre rest, follow rest, full swing rest, large and small face plates, and drop-forged wrenches.



18-INCH SWING STANDARD LATHE

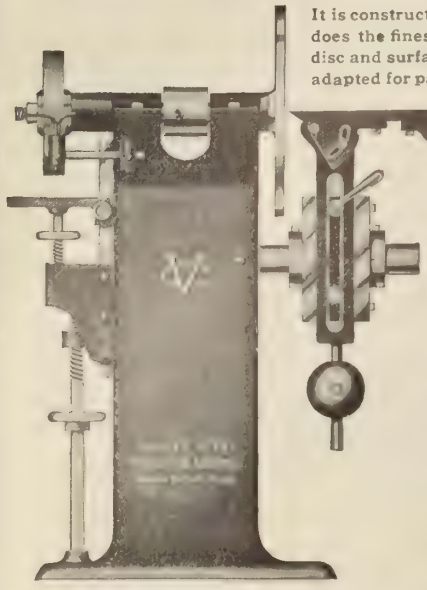
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New Haven Manufacturing Co.
New Haven, Conn., U.S.A.

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No. 9 Disc and Surface Grinder

Here is the Machine
That will Meet ***Your***
Requirements.



It is constructed on practical lines and does the finest kind of work. This disc and surface grinder is especially adapted for pattern shops, die makers and all kinds of tool and surface grinding

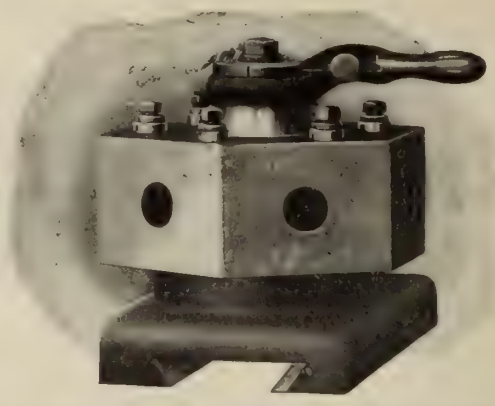
Disc side has table tilting from 0 to 43 degrees. Size of disc table, 10 x 10 in. Diameter of disc, 18 in.

It will solve your vibration problem. It is strongly built of one solid casting; and satisfactory tests have demonstrated that vibration is avoided.

Our Catalogue will Interest You. Write for it now.

Valley City Machine Works
20 Compau Street
GRAND RAPIDS MICHIGAN

Engine Lathe Transformed Into a First-Class Turret Lathe.



Our improved Lathe Turrets will greatly increase the capacity of your Engine Lathes and save their cost in a surprisingly short time. They embody original and patented ideas, and can be furnished in several styles and sizes for lathes of any make.

Style O, illustrated, is extra heavy, with hexagon head. Has taper pin for locking to carriage in a position always in line with the lathe spindle. When work is to be faced up with turret, this pin can be withdrawn.

Want our illustrated booklet?

FAY & SCOTT - Dexter, Maine

Complete line of Standard Engine, Extension Gap and Patternmakers' Lathes, Planers and Shaper Centers.

Canadian Agents—Williams & Wilson, Montreal, Que; A. R. Williams Machinery Co., Toronto; A. R. Williams Machinery Co., Winnipeg; General Supply Co. of Ottawa, Canada.

The Power and Accuracy of the

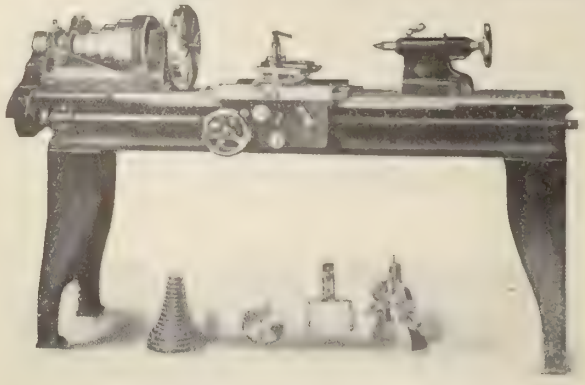
"McKenzie"

ENGINE LATHE

put it in a class that is hard to equal. When you buy the McKenzie Lathe, you secure guaranteed service, as only experts and high-quality material are employed in its manufacture. They are made in two sizes—14 ins. by 6 ft. and 14 ins. by 8 ft. bed, from new patterns of an improved design.

Lathe furnished complete with counter shaft; plain or compound rest, centre rest, follow rest, large and small face plates, wrenches, and complete set of change gears.

Write for Catalog on this "Shop Economizer."



D. McKenzie, Guelph, Ont.



Anti-Accident, Crucible
Cast Steel, "Protected"

Lathe Dog

Any Size, Shape or Form

Safe—Strong—Reliable

Highly recommended by Liability Companies and Factory Inspectors.

Send for leaflet and prices.

Patent Pending

The West Steel Casting Co. - Cleveland, Ohio

Small Steel Castings Crucible and Converter

MACHINE TOOL
AND
DIE MAKERS

Russell Machine Co. St. Catharines, Ont.

First-class
Workmanship

Prices Right

Estimates Furnished to the Trade

The advertiser would like to know where you saw his advertisement—tell him.

The Gridley Automatic Turret Lathe

Will Increase Your Output and Reduce Your Labor Expenses

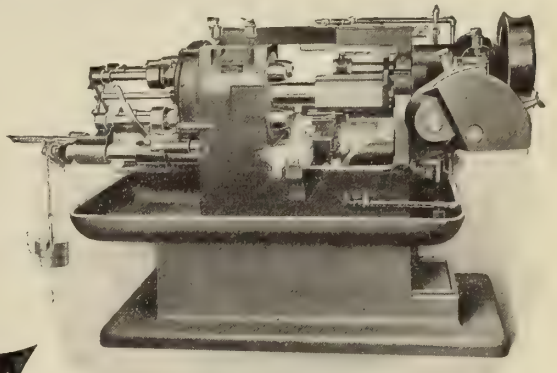
The Gridley is not an ordinary automatic, because in addition to handling any bar of metal within its capacity that can be made on any automatic, it handles work of greater length and of more complex character than other machines of this kind.

A saving of time and money will always result from the use of Gridley Automatics, as one operator can attend to several machines at once, and can use tools tandem on each machine when rapid production is necessary. On all other automatics there is an over-hang of the tool This overhang prevents the performance of accurate work, because the method of supporting tools does not permit as heavy cuts or as coarse feeds.

GRIDLEY Automatics are the assurance of accuracy and economical service. Write us for illustrated catalog and particulars—the GRIDLEY is worth investigating.

We manufacture both Multiple Spindle and Single Spindle Automatics.

"GRIDLEY" Multiple-Spindle



Windsor Machine Co.

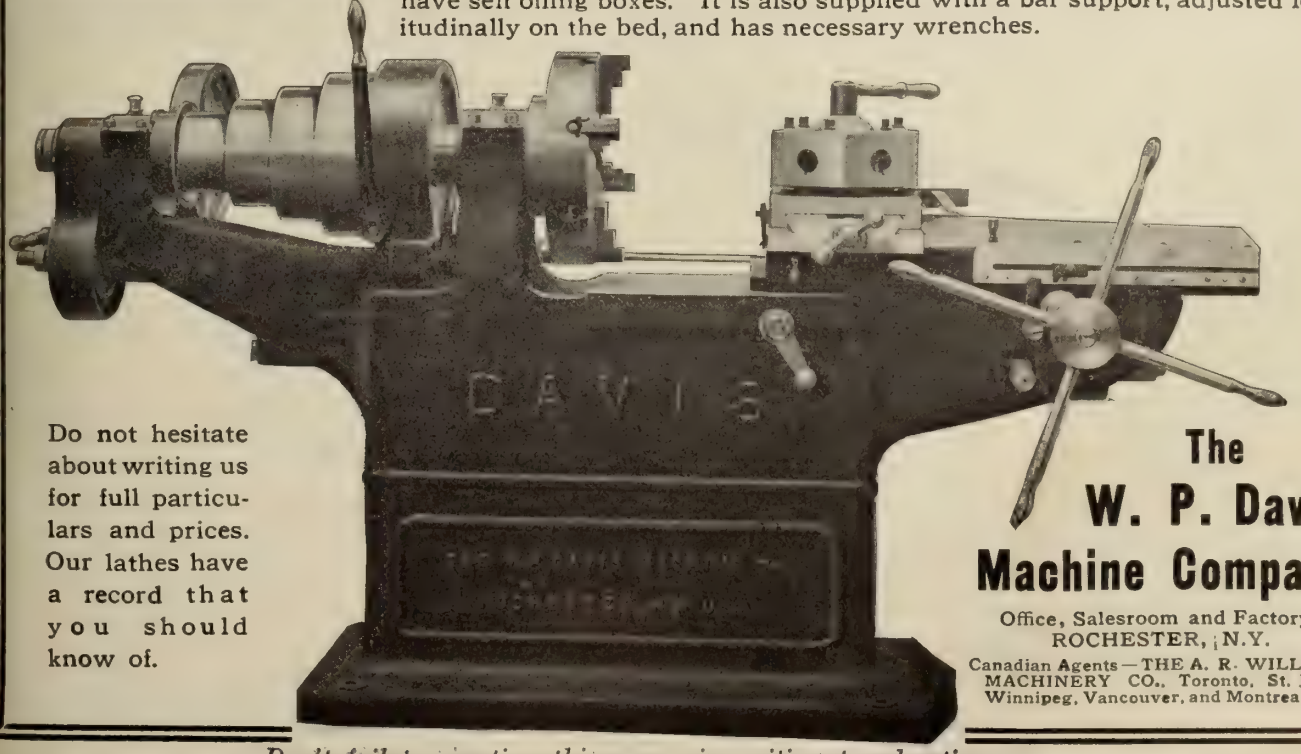
WINDSOR, VT., U.S.A.

Manning, Maxwell & Moore, Inc., Agents for United States and Canada. Craven Bros., Ltd., Manchester, Eng., Manufacturers and Sole Agents for Great Britain and Colonies M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany, Agent for Germany, Belgium, Italy, Holland, Switzerland, Austria-Hungary. Office for France, 68 Avenue de la Grande Armee, Paris, France. J. Ryan, Manager.

24-in. "Davis" Turret Head Boring & Forming LATHE

This machine has geared friction head and back gears, and is fitted with a positive clutch when the back gears are used for heavy work.

Regular equipment includes a countershaft, having two friction pulleys of our own design, and hangers have self oiling boxes. It is also supplied with a bar support, adjusted longitudinally on the bed, and has necessary wrenches.



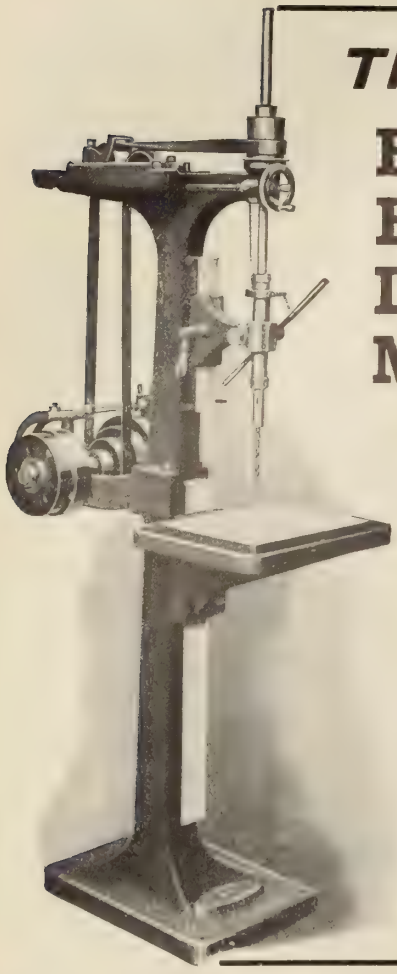
Do not hesitate about writing us for full particulars and prices. Our lathes have a record that you should know of.

The W. P. Davis Machine Company

Office, Salesroom and Factory: ROCHESTER, N.Y.

Canadian Agents—THE A. R. WILLIAMS MACHINERY CO., Toronto, St. Johns, Winnipeg, Vancouver, and Montreal.

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The AVEY

Ball Bearing Drilling Machine

will give you

Greater Production at Reduced Cost

because it can be run at higher speed than other machines, and it is the quickest, simplest and easiest adjusted.

NO TIME WASTED.

Built in single and multiple spindles. Various sizes.

Get our circulars.

THE
Cincinnati Pulley Machinery Co.
CINCINNATI

Manufacturing Drilling Machines

OF HIGHEST EFFICIENCY



16 SIZES, 5 TYPES

FOR DRILLING HOLES ¾ INCH AND UNDER

They have rigidity for heavy work and power to drive high speed steel drills to the limit of endurance.

Compact in shape, only the minimum floor space is required; silent chain and positive gear drive replace the usual belts; every operating convenience to save time and labor.

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THE TAYLOR & FENN COMPANY
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98 Holes Per Hour on a Sibley Hi-Speed

against

73 Holes Per Hour on Cone Driven Drill Presses

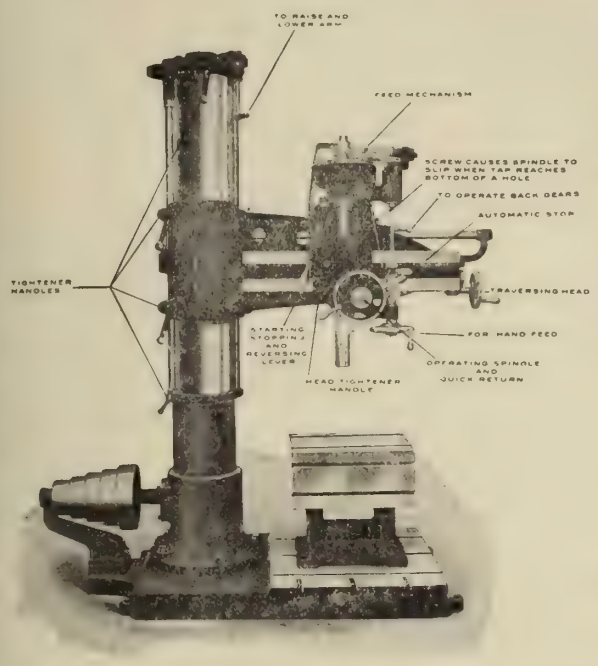


A plow beam is one of the most difficult pieces to drill. Being made up of very tough steel, seldom uniform in composition, and with unskilled labor operating on a piece-work basis, only the sturdiest machines will stand up under the strain.

30 Hi-Speeds in this Plant.

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MUELLER RADIAL DRILLS



COLUMN. Patented Stationary column insures perfect rigidity, eliminates vibration, and prevents springing of the arm. This is one of the most valuable features of the MUELLER Radial Drill.

ARM is made in pipe section, and when clamped to the column it has the same resisting power as it would have if column and arm were one piece. This means no spring to the arm.

FEED. We have a combination Positive and Friction feed and arrange for eight changes of feed. All changes can be made while the drill is at work.

TAPPING MECHANISM. Our combination low and high speed reverse for backing taps out is something entirely new. It has made possible unheard of reductions in tapping costs.

CONSTRUCTION. The construction of our drill is extremely simple. All operating levers are located directly in front of the operator.

We can arrange our machine with speed-box, motor drive, and can furnish any style of table.

LET US SEND YOU FURTHER PARTICULARS

When you think of Radial Drills think of MUELLER

The Mueller Machine Tool Co.

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Is Built for Severe and Economical Service.

It has never failed to deliver the goods under the most exacting conditions.

Besides saving space, labor and handling, it does the work equally as well as any two separate machines on the market.

We can give you power feed, lever feed, and tapers in any combination, from two to seven spindles to a machine.

You should have our illustrated catalogue and price list. They will be valuable to you if you want to instal shop economy.



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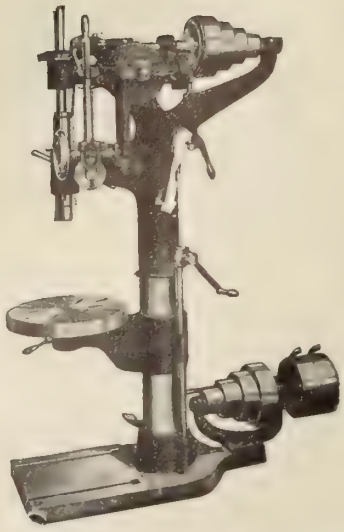
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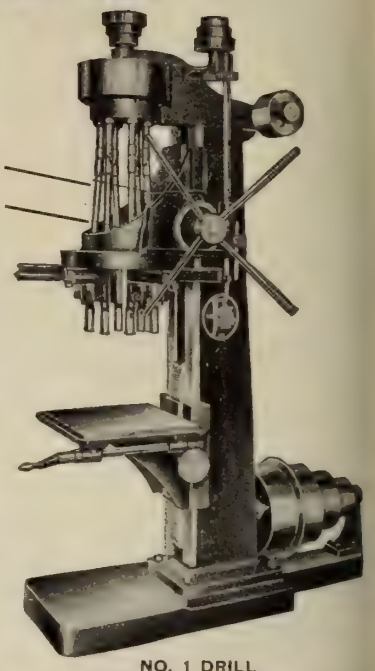
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How convenient to operator every operating lever on machine is located.

Our construction of Spindle Bearing and Supporting Arm will interest you.



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Hydraulic Power Screw Any Pressure Any Size

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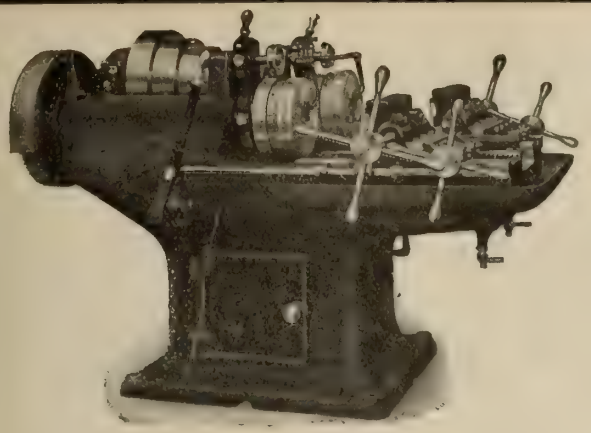
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Manufactured under Davy Bros., Ltd., Patents.



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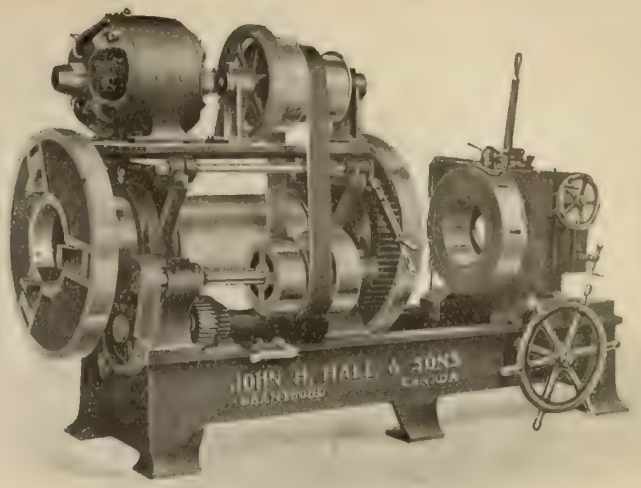
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Our No. 18, Duplex Improved, equipped with Peerless Die Head mechanism.

Capacity 8 in. to 18 in., either belt or motor drive.

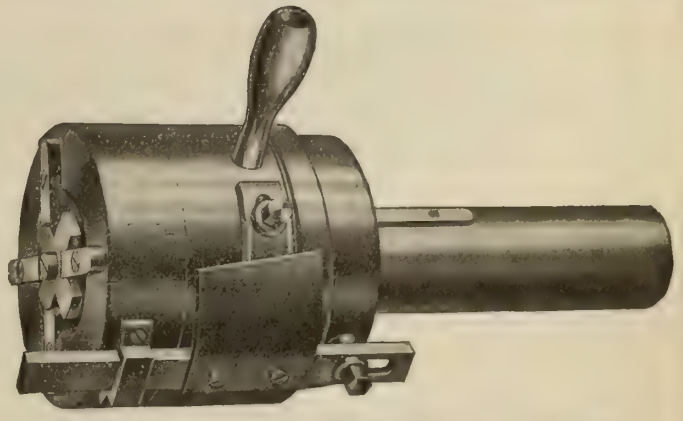
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No More Power is Necessary

for cutting a taper thread than for a straight thread of equal diameter, where the GEOMETRIC TAPER THREADING DIE HEAD is used. One of these Die Heads fitted to your Screw Machine or Turret Lathe will give you accurate taper threads at slight cost. Can handle any range of taper threading work.



GEOMETRIC TAPER THREADING DIE HEAD

Far better than a Special Machine, for it leaves you the Screw Machine for other work when not cutting tapers.

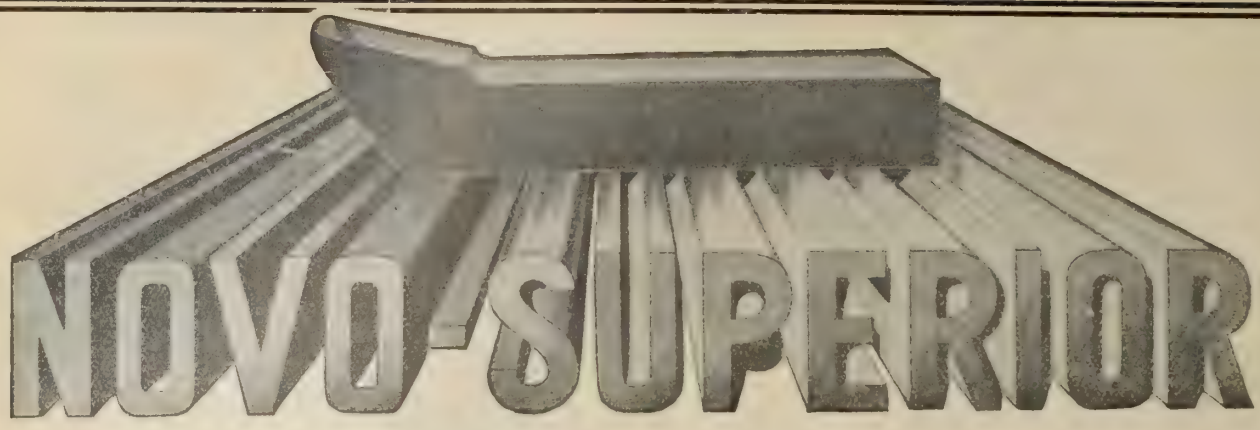
These Die Heads are successfully cutting the taper threads in Locomotive Wash-Out or Mud Plugs, Corporation Cocks, Beer Cocks, Special Faucets, etc.

Let us get in touch with you. Tell US your requirements.

The Geometric Tool Company

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High Speed Steel Has a Solid Foundation In a Name That Means Something

Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

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Are the Choice of Skilled Mechanics Who Demand a First-Class File

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With it a man can save time and money, for the reason that its cutting quality and special temper allow more work to be done in a given time than with any other file.

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FIRTH'S FILES GIVE SATISFACTION

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Allen's IMPERIAL Special (The new improved) High-Speed Steel

which may be either air-hardened, oil-hardened or water-hardened.

This *Imperial* Special Steel will cut much harder materials than can be cut with Tools made of ordinary best High-Speed Steel, and heavier cuts may be taken, or Machines may be driven at accelerated speeds when (in either case) it is found economical to do so. *Imperial* Special will also wear much longer than ordinary best High-Speed Steel before requiring to be re-ground.

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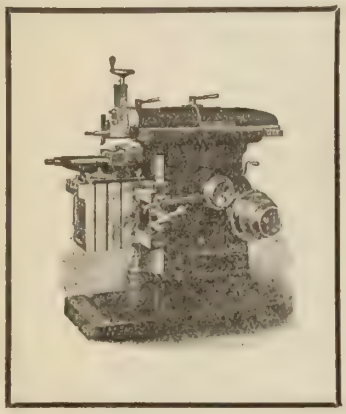
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3 in.	$2.45	4 3/4 in.	$4.35
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4 1/4 in.	3.35	6 1/4 in.	10.00
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They do not split and will outlast many dozens of the ordinary handles. Mechanics prefer them on account of the agreeable touch which makes work a pleasure. Their use is protection against sore hands and splinters. The price is lower than that of wood handles. Ask for discounts. If your dealer cannot supply you write us direct.

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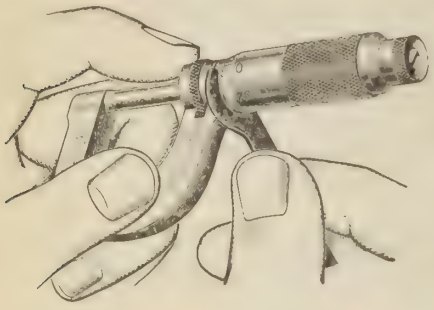
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We would like to have your enquiry when you are in the market, as we believe that we can show you better value for your money than any other Shaper manufacturer in the United States. Every machine, before it leaves our shop, is run under belt for at least a week, and it is therefore sure to be in good working order, and will give satisfaction. We would like to send our catalogue describing the superiority of STEPTOE SHAPERS.

The John Steptoe Shaper Co.

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The Simple Adjustment



of the Starrett Micrometers is a feature that enthuses all mechanics. It takes up any wear quickly and accurately—not by the trial, hit-and-miss way of the movable anvil. This is obtained by placing over the barrel a thin, graduated sleeve, which carries the base or zero line, instead of having it marked on the barrel itself. If at any time, on account of excessive wear, the zero line is not correct, a small turn of this sleeve with a small spanner wrench will remedy the error. The spanner wrench is sent with the Micrometer.

When you see any Starrett Tool you will notice some little difference which makes it better—which makes the Starrett Tools known and trusted wherever accurate work is done.

Catalog 193 is free. It tells of and illustrates all the fine Starrett Tools.

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MICROMETER CALIPERS---all sizes to 24″

You should know about the adjustments on these. It's worth while.



SEMI HIGH SPEED STEEL COMBINATION CENTER DRILLS

These will do a very large amount of work; worth more, but cost the same as the old Carbon Drill.

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PROVIDENCE, R. I., - U. S. A.

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Why not? Because the tools are so much better than they expect.

We are specialists in these two lines and put our whole efforts into making them the best.

They are used by the most particular people, because it means economy. If you are not using them, it will be worth while investigating.

Send to us for catalog C and give us name of your dealer and we will see that you are quoted prices.

ARMSTRONG

DROP FORGED STEEL LATHE DOGS



All Kinds
All Sizes
3-8 in. to 8 in.

POINTS OF EXCELLENCE

Uniformity of design.

Tool steel set screws with our improved beveled point which prevents upsetting.

No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.



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Have Armstrong Quality

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If you Want the BEST Specify ARMSTRONG Drop Forged Dogs



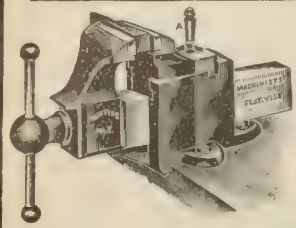
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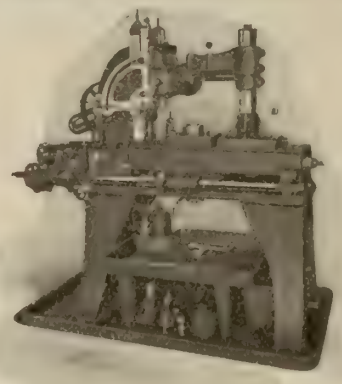
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Prentiss Vise Company

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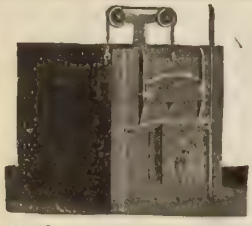


The Whiton AUTOMATIC Gear Cutting Machine

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ROCKWELL Heat Treating FURNACES

For the heat treatment of automobile parts, springs, shafts, gears and other steel parts requiring accurate and uniform heating. Built in a variety of sizes and types.

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Made in Canada.
Stock carried for **immediate shipment.**







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STOCK CARRIED BY

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H & E PATENT BALL BEARING LIFTING JACKS for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.

Made in plain and foot lift styles, fully guaranteed.



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THEORETICALLY CORRECT
IN
RAWHIDE OR METAL

ROBERT GARDNER & SON LTD
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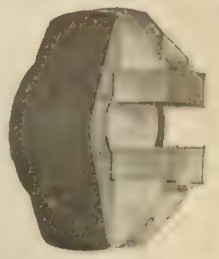
The Drill with CORLISS VALVE MOTION
30% greater efficiency guaranteed.

Independent Pneumatic Tool Company

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TRY THE
Garvin Automatic Wrenchless Chucks

and be convinced of their big labor saving features. Simple to operate and no complicated parts to get out of order.

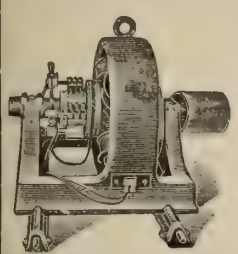


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Full description in E Catalog
Visitors welcome

The Garvin Machine Company
Spring and Varick Streets, New York City

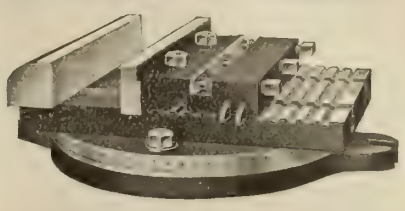
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TORONTO & HAMILTON ELECTRIC CO.



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for Light and Power
AND ALL
ELECTRICAL APPARATUS

Union Planer Chucks



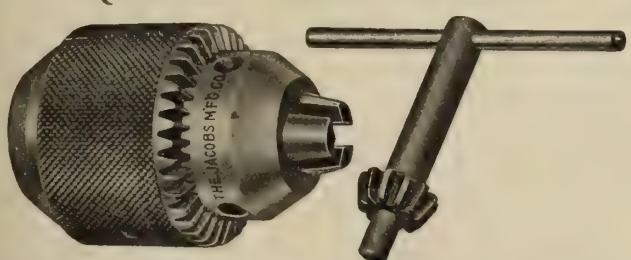
Round Base
and
Square Base

No. 76, with Round Base. "The Best Chuck" made for the planer. Also other styles shown in complete catalogue.

Union Manufacturing Co.

26 Cortlandt Street, New York NEW BRITAIN, Conn., U.S.A.
MAKERS OF A COMPLETE LINE OF CHUCKS

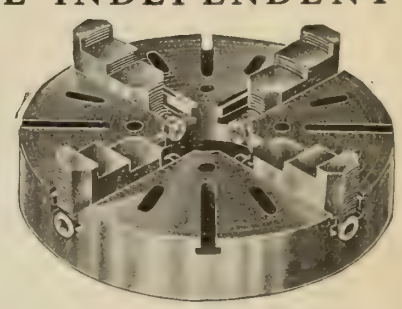
QUALITY WINS SUCCESS



The QUALITY of the Jacobs Improved Drill Chuck is the reason why 105,500 of them have been purchased. The reason why more than 3,330 Jacobs Improved Drill Chucks were purchased during March and April, 1911, is because of their proven superior QUALITY. Each part of the Jacobs Chuck is fully guaranteed.
Write to-day for our new illustrated catalogue.

The Jacobs Manufacturing Company, - Hartford, Conn.

ALL STEEL INDEPENDENT
4 JAW
CHUCK



Genuine Steel Castings are used. Note the wide jaws, exceptionally large screws with double thrust bearings, and ample bearing surfaces needed points for this class of chuck.

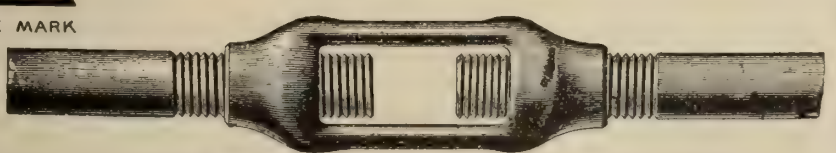
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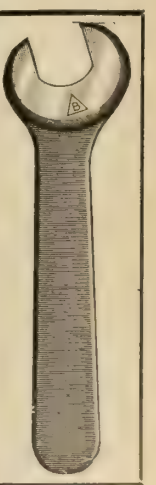
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TRADE MARK

Drop Forged Turnbuckles

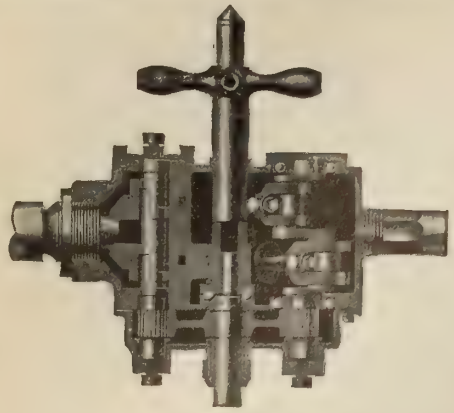


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Send Models of Blue Prints for Estimates.

Machine Wrenches
Screw Drivers
Pliers
Structural Wrenches
Track "
Eye Bolts
Lathe Dogs
Etc.



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Adapted for—Drilling, Reaming, Tapping, Flue Rolling and Wood Boring, and for setting Plain and Flexible Stay Bolts and Nipples.

WE MANUFACTURE

RIVETING, CHIPPING, CAULKING AND BEADING HAMMERS, AIR DRILLS (ALL SIZES), PORTABLE EMERY GRINDERS, SAND RAMMERS, CORNER DRILLS, ETC.

AIR REVERSIBLE — Cleveland AIR TOOLS — **DRILLS** NON-REVERSIBLE

Made in correct sizes for all classes of work.

BALL BEARING TYPE

Annular Ball Bearings on Crank Shaft as shown in the accompanying illustration are an original CLEVELAND FEATURE and are the greatest improvement in AIR DRILL construction since their inception.

Service tests of Cleveland Ball Bearing Air Drills show a gain of more than 40% in power over the plain bearing machine.

Ball Bearings eliminate friction and all lateral motion of Crank Shaft, thus protecting main gear and pinions from undue strain.

CLEVELAND FEATURES

- ¶ ONE PIECE CYLINDER BODY.
- ¶ SINGLE VALVE CONTROL.
- ¶ HAND HOLES IN CRANK CASE.
- ¶ BALL BEARING CRANK SHAFT.
- ¶ THROTTLE OR LEVER REVERSE.
- ¶ INSIDE OR OUTSIDE EXTRACTION OF TOOLS.
- ¶ INTERCHANGEABLE CHUCKS, SQUARES OR TAPERS.

The Cleveland Pneumatic Tool Co.

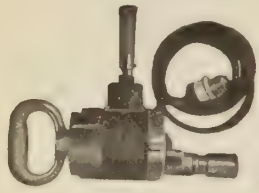
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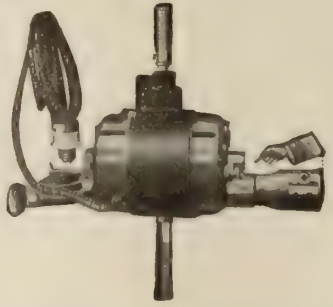
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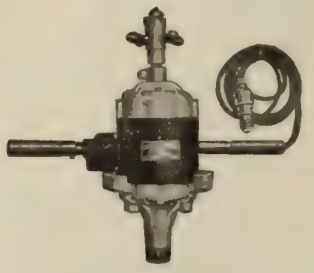
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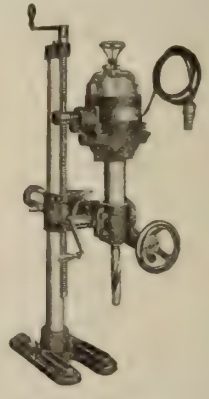
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Speed, 400-750 R.P.M.



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Portable Radial Drill
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"CROWN"
SAND RAMMERS

The following figures show the result of some observations made in representative foundries all over the country. They are not merely "test" figures, but show what can be accomplished with the "CROWN" Sand Rammer under every-day working conditions:

Size of Cope	Time in Peining and Ramming		Ratio of Reduction	Per Cent. of Time Saved
	By Hand	By Sand Rammer		
12 ft. x 18 in x 4 in.....	5 min.	1 min.	1 to 5	80
12 ft. x 18 in. x 10 in.....	10 min.	1½ min.	1 to 6.6	85
6 ft. x 3 ft. x 6 in.....	20 min.	3 min.	1 to 6.6	85
7 ft. x 3 ft. x 12 in.....	1 hour 30 min.	16 min.	1 to 5.6	82
15 ft. x 30 in. x 16 in.....	2 hours	27 min.	1 to 4.4	77
19 ft. x 90 in. x 15 in.....	8 hours	1 hour 30 min.	1 to 5.3	81

It is to be especialiy noted that these figures include not only the final ramming, but the most careful peining as well; and the total time covers the completed job.

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Made for Bench and Floor Work. ***Descriptive Pamphlet 8108***

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SHOULD PROTECT YOUR FACTORY AND MACHINERY

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Want This

We Can Protect Your Buildings, Warehouses and Factories with the most Efficient Systems.



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That these are *absolute necessities* in modern factory and office buildings no man who has a shred of progressiveness in his make-up can argue.

Poor daylight and insufficient ventilation mean tired employees, short days, big lighting bills and decreased output.

Yet the ordinary wood sash for factory buildings, if of sufficient size, is so heavy and clumsy in structure that it is not only very *expensive* but *obstructs a large part of the lighting area*, and the difficulty of opening it, particularly in cold or damp weather, prevents proper ventilation.

"Fenestra" Solid Steel Sash

is a light, strong steel frame and sash combined, admitting from 25 to 40 per cent. more light through an opening than wood sash.

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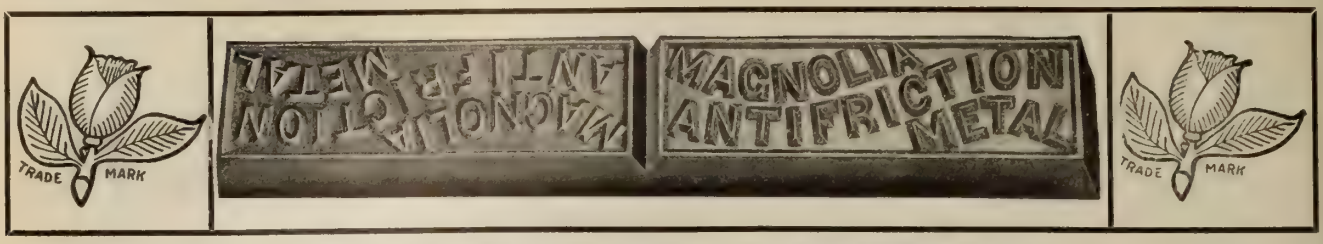
Bear in mind, also, that "Fenestra" Sash are *fireproof* and materially lower insurance rates.

They are made in any size or shape, and are always built to supply individual needs.

If you are planning or erecting an industrial building of any kind that you intend to make permanent let us send you our "Fenestra" catalogue. A post card brings it to your desk. Address "Steel Sash Branch."

STEEL AND RADIATION, LIMITED

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AHEAD AND REVERSE

In one of our recent advertisements showing friction test of MAGNOLIA METAL by the United States Government, using water as a lubricant, you may not have noticed that this test was made both "ahead and reverse."

This word "reverse" is small and inconspicuous and very easily overlooked, but the fact that the engineer officers of the Navy made the test in both directions, shows how important and necessary they considered it in arriving at their determinations.

We believe that it is not generally known that very few babbitt metals will stand reversing, even with oil lubrication, as they rough up on the reverse test like plush rubbed the wrong way.

The fact that MAGNOLIA will stand this test with water lubrication is a wonderful tribute to its anti-friction qualities.

MAGNOLIA, above all other metals, conditions the shaft and bearing very quickly—imparting to both smooth highly-polished surfaces—and then settles down for a long cool run on the minimum quantity of lubrication.

This reverse test speaks volumes in favor of MAGNOLIA.

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LET GRAVITY DO YOUR WORK. THE MATHEWS GRAVITY CARRIER CO. ORIGINATED CONVEYING BY MEANS OF THE STEEL BALL BEARING ROLLERS AND STRAIGHT LIFT ELEVATORS.

SAVE TIME & LABOR



Systems designed without expense.

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MADE IN CANADA.

THE ABOVE CUT REPRESENTS a Manufacturing Plant equipped so that the product travels automatically from any floor above to the ground floor or from the ground floor to any floor above without the aid of other labor than that of placing boxes or barrels upon the carriers at the starting point.

Canadian Mathews Gravity Carrier Company, 312 Stair Building, Toronto

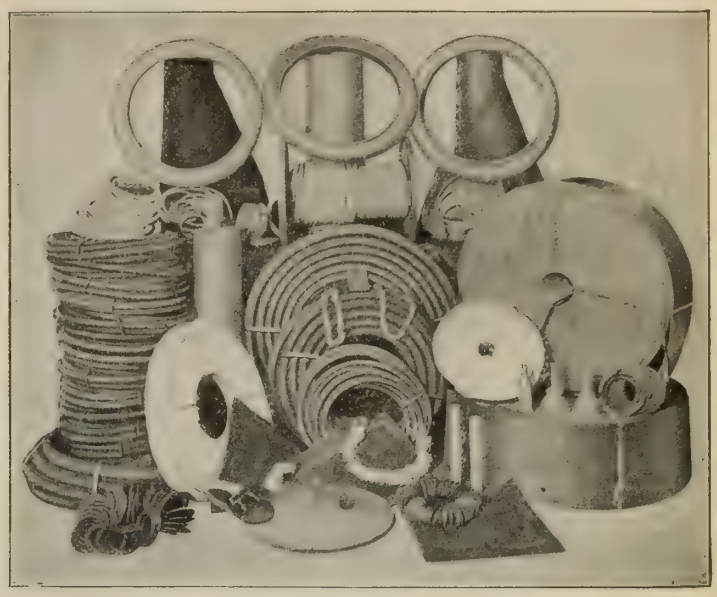
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Only Reliable Suction Hose

If you are in the market for ***hose,*** don't do a thing until you look into the money-saving reasons why you should buy

GOODYEAR SUCTION HOSE

Money-Saving Hose for Contractors, Miners, Dredgers and Others Demanding Hose-Permanency and Hose-Strength.



A Few of the Lines We Manufacture

Longer service, more ***stand-up-ability,*** greater freedom from constant repairs, would make Goodyear Suction Hose an economy at double the price. But it ***costs no more*** than the other kinds.

Non-Collapsible—Non-Rotting

Goodyear Suction Hose never caves in. It is built by a process that makes this impossible no matter how long the hose has been in use. It is built around a heavy steel spiral wire imbedded in the inner tube. Tube can't separate from wire nor can dampness reach it. Hence, rust and rot, one of the common failings of other makes of suction hose, is ***done away with.***

Suction Hose for Oil and Gasoline

We make rough or smooth bore Suction Hose for all purposes; also a complete line of

Water, Steam and Air Hose

Send at once for our catalog. If you are in doubt as to what kind of hose you need, let our expert help you solve your problem. Write us to-night.

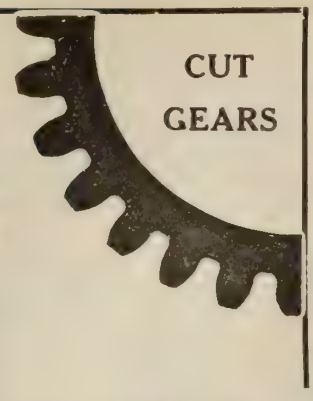
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AT MODERATE PRICE

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OF SPECIALISTS

Hamilton Gear & Machine Co.

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Deflocculated Acheson-Graphite, Dag and Oil.

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Graphite does not dissolve in any liquid or break under pressure, and these qualities, added to the unctious softness and purity, together with its non-coalescing nature, make Acheson-graphite ideal for lubrication purposes.

The process of deflocculation takes Acheson-graphite powder so fine that 99% of it will go through a sieve having 40,000 meshes per square inch, and sub-divides each grain of this finest powder into many still smaller particles—so small that they cannot be seen through a strong microscope.

Oildag is this deflocculated Acheson-graphite suspended in oil, where it neither floats or sinks, but is evenly distributed throughout. Oildag will flow anywhere the oil alone will go.

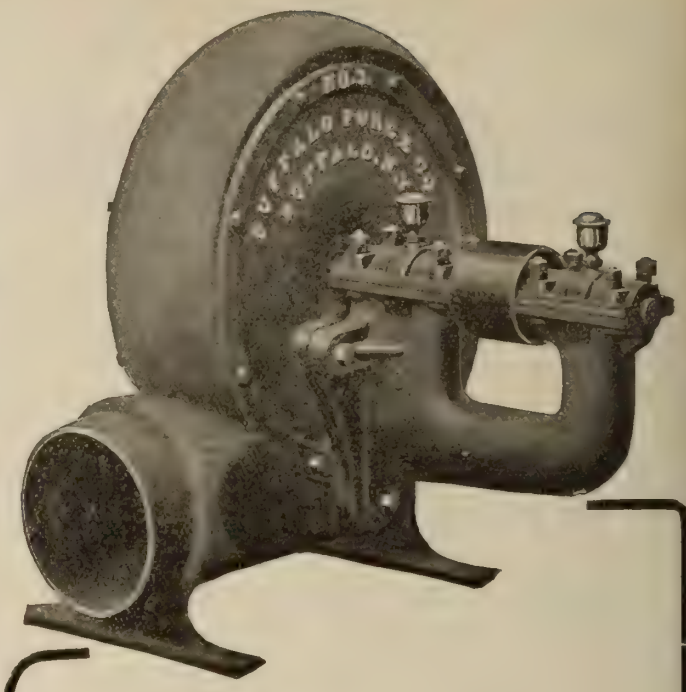
Mr. Robert A. Ross, E.E., of Ross & Holgate, Consulting and Supervising Engineers, Montreal, writes:

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Buffalo "B" Volume Exhausters

have a decided advantage over the usual type in the solid, one-piece peripheral shell.

Not only is this construction very rugged and strong, but the absence of joints under pressure in the shell prevents leakage of air and waste of power. The blast wheel is strongly built, accurately balanced, and, together with the extra long oil-ring bearings insures smooth, easy and quiet operation.

BUFFALO EXHAUSTERS are especially adapted for handling dust and refuse from emery and buffing wheels and tumbling barrels; and smoke, gases and fumes generally. You can always depend on efficient, reliable operation.

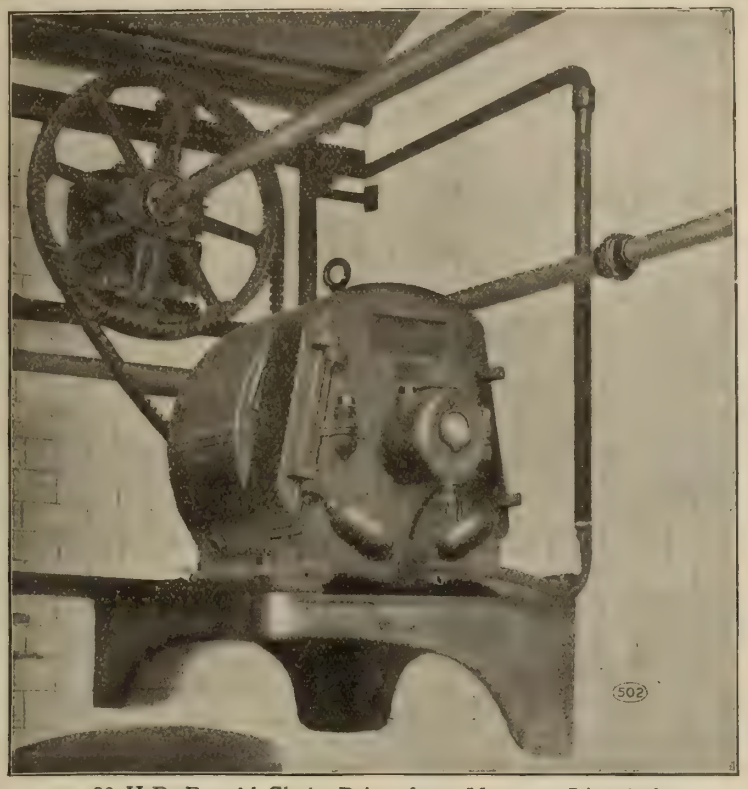
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RENOLD PATENT SILENT CHAIN



30 H.P. Renold Chain Drive from Motor to Lineshaft.

THE drive illustrated is in a printing works where the large presses often work pulsatingly.

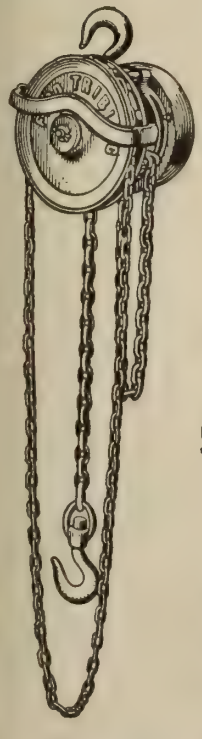
It has now been in daily service over ten years without repair of any kind.

If you are installing any new drives or experiencing any trouble with your present drives, forward us general details and we will gladly give you full information *re* application of chains.

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Jones & Glassco

201-2 St. Nicholas Building
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Tribloc Chain Hoists

Costs less—the Peer of all

Steel Working Parts

All sizes—¼ to 40 tons.

Highest efficiency. Parts interchangeable. Repairs for triplex blocks in stock.

Manufactured by

Ford Chain Block & Mfg. Co.
PHILADELPHIA, PA.

Gem Shafting Lightens Labor

It enables you to take the tool to the work, instead of carting the work to the tool. Our Portable Emery Grinder is a high class general utility tool of wide range. It is *useful, practical* and *convenient.*

Write for catalog and remember—the *Gem guarantee is binding.*



GEM GUARANTEE GOOD



The Gem Oiler
is an economical oiler

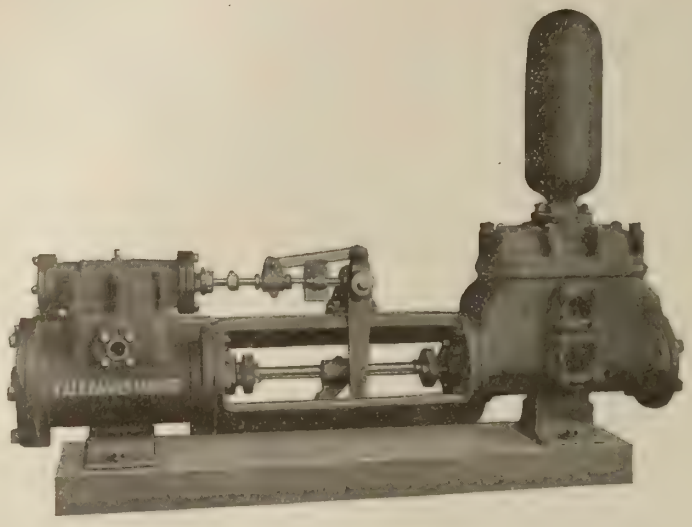
It has a patent cleaning device that saves time and oil. It is exceptionally strong, machine made and interchangeable in all parts. Its durability is guaranteed. Made for all purposes.

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The superior excellence and splendid results shown by

"FAIRBANKS-MORSE"

pumping machinery are largely due to the fact that for many years we have manufactured Hydraulic Machinery of all descriptions. We are therefore able to build pumps which are properly designed and adapted to every-day use. This is of the greatest importance in a first-class pump, for the usefulness of an engine may be lost if the pumping machine is badly designed.

You will get all these important features when you purchase a "FAIRBANKS-MORSE" pump.

Let us solve your pump problems.

THE CANADIAN FAIRBANKS-MORSE CO., Limited

Fairbanks Standard Scales—Fairbanks-Morse Gas Engines
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Montreal Toronto Winnipeg Vancouver Calgary St. John, N.B. Saskatoon Ottawa

The Canada Steel Co. Rail-Carbon-Steel Rolling Mill

By J. H. Williams*

Being a brief illustrated description of one of the more recent additions to the many industries now located in Hamilton, Ont., and Which Has for Its Purpose the Turning to Further Service in Other Fields of Selected Old Steel Rails.

FOR the past fifteen years rail-carbon steel has been meeting with much success in the United States, and a plant for its production has now been started in Canada. The Canada Steel Co., Ltd., are located at Hamilton, Ont., and the output of their mill consists entirely of steel of the above grade, rolled from selected old steel rails having a carbon content of about .40.

Such a product has its well defined uses, and for certain purposes is superior to ordinary mild steel. Thus, for agricultural implements, bedstead angles, telephone line material and other construction purposes calling for lightness combined with stiffness and strength, rail-carbon steel can be used with considerable economy. Its elastic limit is about 50,000 lbs., and its ultimate tense strength about 85,000 lbs. per square inch. Again, the high elastic limit claimed makes it particularly valuable for reinforcing concrete. As compared with mild or medium steel having an elastic limit of from 30,000 to 35,000 pounds, rail-carbon steel will give greater reinforcing strength, or a smaller quantity can be used to give an equivalent result.

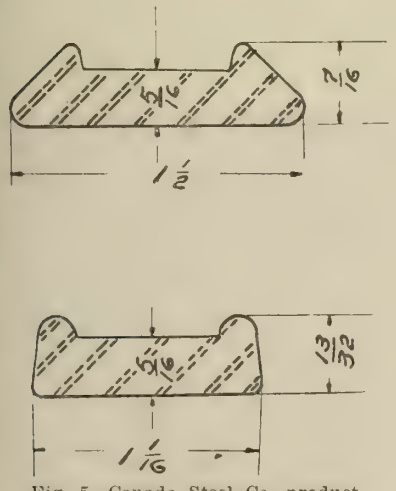


Fig. 5—Canada Steel Co. product.



Fig. 1—Canada Steel Co. rail yard and shops.

Description of Plant.

The plant, situated on about six acres of land, is served by both the Grand Trunk and the Toronto, Hamilton and Buffalo Railways. Old steel rails, purchased from roads in Canada and the States, are received at the west end of the yard, Fig. 1, and there stored. As a first step in the process of manufacture of the new products, they are broken by hand labor only into 7½ and 11 feet lengths, the flange being nicked with a a cold set, following which half a dozen good blows of the hammer serve to make a clean break. The rail is turned after every second blow, and needless to say there is a certain knack required to break it clean. Men at this job are on piece work, and make $3 to $3.50 a day.

The Furnace.

After being broken, the rails pass to a continuous heating furnace heated by coal and 40 feet long by 12 feet 6 inches wide. A noticeable feature of the mill is that no steam whatever is used for any purpose. The furnace ash pits are water sealed, and the dropping of the hot ashes into the water generates sufficient steam vapor to soften the clinker on the grate bars. Many mills use boiler steam for this purpose. Draft is supplied to the furnace by a 36-inch Sheldon belt-driven fan operated by motor.

The rail is pushed into the coolest end of the furnace by an electrically driven pusher. This is shown in Fig. 2, from which it will be seen that the rail en-

*Associate Editor.



Fig. 2—Canada Steel Co. rail feeder and furnace.



Fig. 3—Canada Steel Co., rolls equipment.

ters crossways. Each advance of the pusher moves forward all the rails in the furnace by a distance equal to the



Fig. 6—Canada Steel Co. product finishing department.

pusher's stroke, and by the time they have reached the other end they are at the proper heat for rolling.

The Rolling Mill.

This consists of six sets of 12 inch three-high housings, and one set of two-high housings, making a seven stand mill, as shown in Fig. 3. The rail is brought from the furnace by means of a "telegraph" or traveller. The first pass through the rolls splits it into three pieces, head, web and flange—see Fig. 4. Each part is then picked up, and passed



Fig. 4—Canada Steel Co., rail stock in process of re-manufacture.

back and forth through the various sets of rolls and made into finished bars at one heat. The head of the rail is rolled into rounds, squares and flats, while the web and flange are mostly used for angles, flats, agricultural shapes, etc. The company makes a specialty of sleigh shoes, sections of which are shown in Fig. 5. Rail-carbon steel forms an ideal material for this purpose and large quantities of these sections are rolled.

Further Equipment.

The furnace and rolls are located at the west end of the mill, while at the east end are located two power shears, one set of straightening rolls for angles and flats, and two twisting machines for twisting the square bars used for reinforcing concrete. Fig. 6 shows this end of the shop. The production of the mill varies of course with the demand. As many as 55 tons of finished bars have been produced in 11 hours, which must be considered a very creditable performance when it is remembered that the mill only began operation on May 1st of this year, and has consequently hardly yet got into its stride.

The Drive.

A Canadian General Electric Co. A.C. motor of 500 h.p. drives the rolls by con-

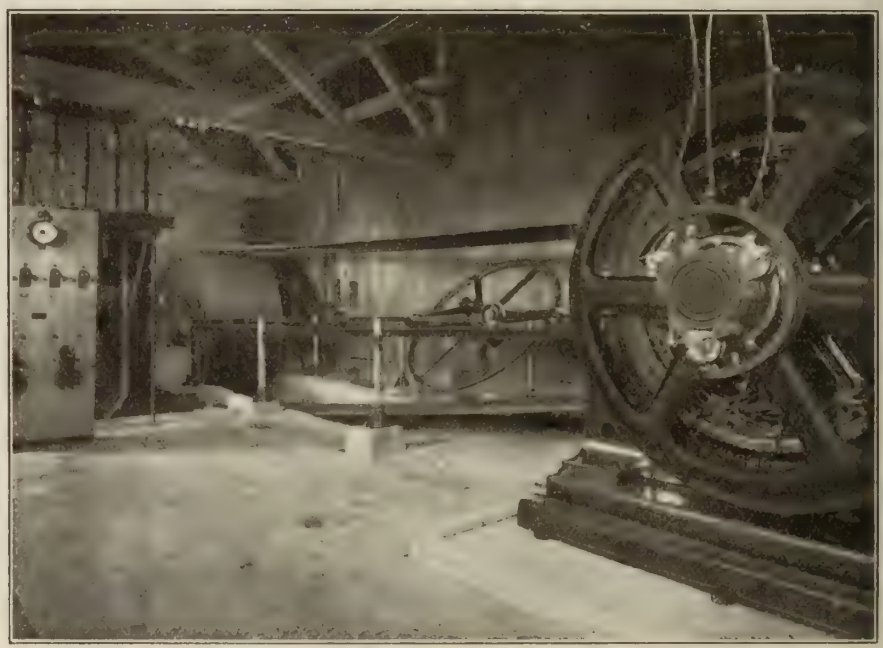


Fig. 7—Canada Steel Co. power equipment.



FIG. 8—CANADA STEEL CO. PLANT, HAMILTON, ONT.

tinuous rope drive, as shown in Fig. 7. The rope is 1¼ inch Manilla and takes 28 turns round the pulleys, the latter being spaced at 30 feet centres. The tension is taken up in the usual way by a pulley on a travelling carriage controlled by cheese weights. The motor runs at 425 r.p.m. and the mill at 180 r.p.m.

Machine Shop.

In the machine shop attached to the plant, the rolls are turned and general repairs made to the various machines.

Its equipment consists of one 18 inch engine lathe, one 18 inch drill press, one 16 inch shaper, one power hacksaw, one double emery wheel grinder, and one double-end roll lathe. Fig. 8 shows a general view of the mill as seen from the office which is situated on Sherman Avenue N.

Mr. W. N. Currie, is managing director of the company, and Mr. W. W. Leck is superintendent of the mill.

Some Everyday Uses of the Oxy-Acetylene Blow Pipe

By L. G. Dennison, B.A., B.Sc. *

The process of oxy-acetylene welding and cutting although largely practised in a variety of circumstances, which call for ingenuity of application to secure satisfactory results, is nevertheless not as familiarly known, we believe, as it might be; hence the unfolding of carefully selected data, secured from a firm of repute in this business, by the writer, for the benefit of readers of Canadian Machinery.

THE process of oxy-acetylene welding is extensively adopted for the repair of broken parts, a purpose which was perhaps largely responsible for the original invention. Its scope is, however, not limited to this feature, as evidenced by the fact that most industrial plants engaged in the manufacture of machinery have found an oxy-acetylene installation indispensable as a unit in their general equipment..

Here, it may be pointed out, that our two principal railroads, the C.P.R. and the G.T.R., are among those who find such an apparatus of the greatest possible service and value.

The Oxy-acetylene Flame.

The oxy-acetylene flame has a temperature of 6,300 degrees Fah., the highest attainable by combustion. This high temperature is easily explained since acetylene is endothermic,—absorbing heat when being formed. When it burns with oxygen, the heat developed by the decomposition of acetylene into carbon and hydrogen, is added to the heat of combustion of these elements; besides, the concentration of carbon in acetylene is greater than in any other gas,—an increased quantity being as a matter of fact impossible.

Ease of regulation is another feature of the oxy-acetylene flame. Further it gives, by nature, a reducing atmosphere, which prevents the metal from oxydizing. This latter undesirable action takes place in the use of other gases, especially when welding steel.

Oxy-acetylene Cutting.

The blow pipe is a most effective apparatus and finds useful and effective application in cutting risers from steel castings, cutting dies, cutting-out shafting from heavy ingots instead of forging, and cutting beams and ironwork in wrecked or burned structures. It is also used to advantage in cutting manholes in boiler shells as well as for boiler work generally.

The blowpipe is seen in the welder's hand in Fig. 1. As adapted for cutting, it has four holes in the nozzle, one centrally located and three placed concentrically at a radius of about ⅜ of an inch. Oxygen issues from the central orifice and a mixture of oxygen with gasolene or acetylene gas from the others. The oxy-acetylene flame renders the metal red hot, while the oxygen, whose pressure can be regulated, burns the iron to iron oxide. This latter flows away, leaving a clean cut. The flame is moved slowly along the line to be cut, while the torch can be put in a special machine which will move it in any path and keep it perfectly steady. This latter is used particularly for cutting-out circular discs. Some idea of the speed of the work will be gathered from the fact that an armor plate 12 inches thick and one foot long can be cut through in six minutes. Work on armor plates for warships which used to take thirty days can, by the cutting process, be completed in one day. Fig. 2 shows sample plates cut by this method.

The total cost of cutting is from about ½ to 1 cent per square inch of section cut, and the usual rates of cutting will be gathered from the first table on the following page.

In Fig. 3 there is shown a picture of the wreckage of the steel beams in St. Jean Baptiste church, Montreal, recently destroyed by fire. The firm of R. J. Levy have taken the contract to cut down this tangled mass of steel



Fig. 1.—Welder at Work.

*Associate Editor, Montreal.

within a month by means of the oxy-gasoline blowpipe. It is estimated that the work would take six months without the blowpipe. All the large beams cut-up into several pieces bring a better price as scrap.

Thickness of part to cut	Pressure of oxygen	Diameter of opening of oxygen outlet for cutting	Minutes to cut one ft. long.
Up to ½ inch	2 Atmospheres	3-64	1
" " 1 "	2 "	"	1 2-3
" " 2 "	2½ "	"	2
" " 3 "	3 "	"	2½
" " 4 "	3½ "	1-16	3
" " 5 "	4 "	"	3½

Oxy-acetylene Welding.

For welding the blow-pipe has two uses,—first the repair of broken parts, and second, the manufacture of various apparatus, by welding together sheets, profile irons, bars, tubing, etc.

Figs. 4 and 4A, "before and after welding," will give an idea how a costly broken casting can be mended for a few dollars, with resultant strength from 85 per cent. to 90 per cent. of the original. Welding is also used to repair broken crank-shafts and pulley spokes, to fill cracks in engine cylinders, to build up rivets and corrosion pittings in boilers, to renew gear teeth by adding metal, and to make good the deficiencies due to blow holes.

In the manufacture of new composite pieces, its uses are unlimited. Fig. 5 shows how profile irons are welded together for work bench and stand purposes. Fig. 6 shows a high pressure steam collector welded from I beams. Fig. 7 shows a cooler with pipes and flanges joined by welding. Fig. 8 shows a seat and desk welded from sheet steel and tubing.

Besides these, ladders, drums, jackets and tanks are each and all possible of construction by welding.

It is apparent that in addition to mechanical and speed considerations, welding has a great advantage in the matter of cost. The speed of the work causes a low labor charge. The cost of the gases is also comparatively low, all of which, together with a moderate equipment cost, goes to show that the installation of welding equipment will be a machine shop habit in the near future.

App. thickness of plate in inches	Foot run per hour	Oxygen Consumption: cu. ft. per hour	Acetylene, Cons. cu. ft. per hour	*Approximate cost per foot run
1-16	40	4	3	$0.011
3-32	24	5½	4	0.020
1-8	18	9½	7	0.032
3-16	10	14	12	0.077
1-4	7	22½	17	0.106
3-8	4	32	25	0.340
1-2	3	40	30	0.530
5-8	2	52	40	1.005

*Taking oxygen at 2½c per cu. ft., acetylene at 1c per cu. ft. and labor 30c per hour.

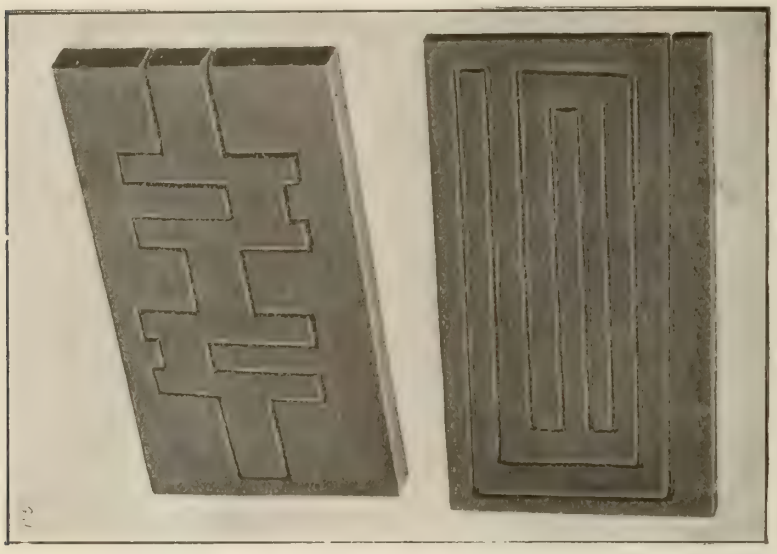


Fig. 2.—Steel plates cut by the Oxy-aceyline Blowpipe.



Fig. 3.—Wreckage of Steel-Work, St. Jean Baptiste Church, Montreal.



Fig. 4.—Broken Casting, before Welding.

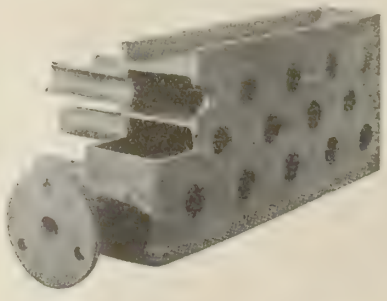


Fig. 6.—Welded Steam Collector.



Fig. 4A.—Broken Casting, after Welding.

The writer is indebted to R. J. Levy, Montreal manufacturer of oxygen, and Canadian agent for the "Societe L'Air Liquide" Paris, for the cuts and data which supplement this article.



Fig. 5.—Profile Irons Welded.

TRADES AND LABOR COUNCIL.

TWO important subjects occupied the attention of the Trades and Labor Council, Fort William, at its last regular session, these being the establishment of a labor bureau, and the starting of evening classes.

E. E. Wood, supervising principal of public schools, attended, and spoke on the matter of the establishment of classes in the evening for the workers of the city. He said his first idea had been to get a nucleus, say fifteen, of men who were taking a course in correspondence schools, and help them out with the tasks, for a man made far greater progress when little matters of which he had not had a good conception were promptly explained to him.

The chairman, W. McNicol, said that he had canvassed one shop in the city to see who would become interested in technical studies, and did not find anyone taking a correspondence course, but eight men signified their willingness to join a class.

Mr. Wood said, that the subject came to his mind of the number of young men in the mechanical trades of the city who were endeavoring to improve themselves through correspondence schools, and not having the time to deal with them privately, it had struck him that he might be able to form a class and help those students through their courses. He honored the man who was trying to better his position in the world, and he thought it was an admirable work for the Board of Education to take up, and make profitable to the working citizens. He had learned that there were some hundreds of young men in these cities who were taking such a course, and, as the speaker had taught most of the subjects connected with the mechanical trades, he thought he might be able to assist them, for he found that those who took the private lessons and had everything explained to them made wonderful progress.

With regard to forming classes of men who were not taking the course, he had not contemplated that, though he did not wish to debar anyone from the benefit. It had been his intention to follow the text books of the schools, going through geometry, trigonometry, and allied subjects, giving the men a theoretical understanding of their work, they gaining the practical side at their daily avocation. He was convinced that thousands of dollars were sent away by young men here, who wanted a little assistance.

Secretary Stephens said, that the Trades and Labor Congress had set its face against the trade schools, but Mr. Wood pointed out that there was no mechanical department in connection with these classes, the only idea being to assist the worker through theoretical training and make him a more efficient and capable tradesman.

It was agreed that a committee meet the management committee of the Board of Education to discuss the best method to attain the results aimed at, and the question was adjourned.



Fig. 7.—Welded Cooler.

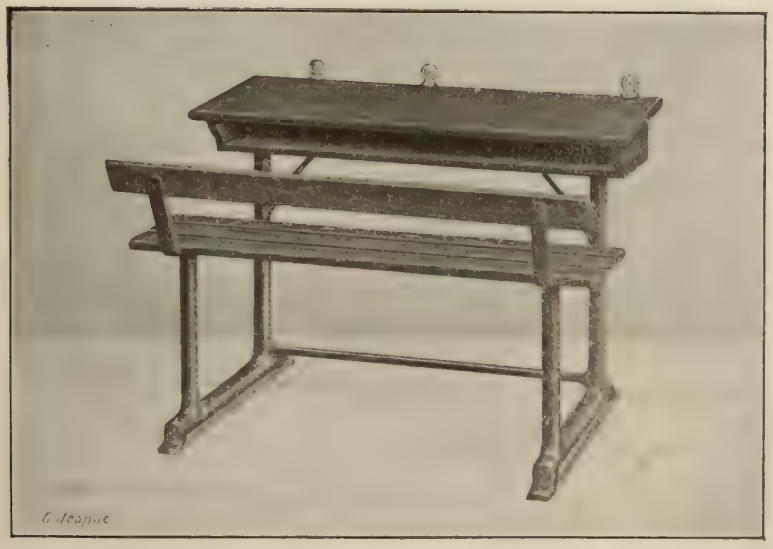


Fig. 8.—Welded Seat and Desk.

INQUIRY—SAFE DIAMETER OF EMERY WHEELS.

I would deem it a favor if you would let me know whether the manufacturers of emery wheels have any data at their disposal which would show the safe diameter for their wheels to wear to. By this I mean,—is there any set rule that governs the factor of safety in an emery wheel as it decreases in diameter from usage? It has occurred to me, in reading lately of several deaths, resulting from exploded emery wheels, that, there may be a known diameter for different wheels, below which it is not safe to operate them. Any information along these lines will be greatly appreciated.—G. Vandervoort.

NEW TYPE OF LOCOMOTIVE.

The London & Northwestern Railway in conjunction with the Great Central Railway, is experimenting with electric locomotives generating their own power. Designs for three of these engines are being prepared. Electricity will be generated by a dynamo driven by a petrol engine. Experiments have previously been made with an electric locomotive in which the dynamo was driven by a steam turbine, but the type proved unsatisfactory in the matter of economy of working. By replacing the turbine with a petrol engine, a great deal of weight and space will be saved. If the new type of locomotive is successful, railway electrification will, it is believed, become a simple matter.

Recent Developments in Tools and Dies for Drop-Forging

by Calliope

Drop-Forging Occupies a Large Place in the Constructional Detail of Many Machines and Appliances Which Form the Product More or Less of Almost Every Mechanical Manufacturing Concern. The Following Particulars of the Developments in Tools and Dies Should, Therefore, Appeal to a Wide Circle of Readers.

A NUMBER of radical changes have been made in the design of the new drop-forge press brought out by the E. W. Bliss Co., Brooklyn, N.Y., based on the experience gained in their own drop-forge shop. The new features relate to the reduction of wear and breakage. Operating a shop of considerable size and style, size and shape of drop-forgings being numerous and varied, it follows that the hammers receive a severe test on a wide range of work. Some of these tests, a few samples of the forgings produced by them, and a description of the dies in which they are formed, will be here discussed.

Propeller Wheels.

On the left of Fig. 1, are shown two halves of the die that forges the propeller wheel, used for the submarine torpedoes made by the E. W. Bliss Company. These propeller wheels are made of drop-forged steel, great strenbth being required to push the torpedoes through the water at the rate of 23 knots per hour. In making these, round blocks of steel are cut up as shown at A in the upper left-hand corner. Each block is drawn out by the man on the steam hammer, to the shape shown at B. On one of the blades, as at C, an end is drawn out, to serve as a handle during the drop-forging process. After this operation, the piece is taken to the drop-forge press, and hammered into the two half dies shown below. It then assumes the shape shown at D.

Owing to the difficulty of making trimming dies, and the number of propeller wheels wanted, not warranting the expense, the flash is trimmed off by hand, leaving it as shown at E. In the machine shop, it is made absolutely smooth and true to size, by machining with profile cutters.

Odd Shaped and Large Forging.

In the right-hand half of the cut is shown an odd-shaped piece, requiring an irregular parting line on the forging dies. At F is shown the lower die used in forging this piece, and at G the upper half, which is fastened in the hammer of the drop. This piece is forged from a plain bar, and is first broken down between H and I of the two halves of the die. After this it is hammered into shape, and leaves the die as shown at J. It is next taken to the trimming die, the lower half of which is shown at K, and the upper part at L. After going through this, the piece is ready for the machine shop, and in the shape shown at M.

One of the largest pieces drop-forged, is shown in Fig. 2. This is made in several sizes, the largest of which is about 24 inches long. The bar is first

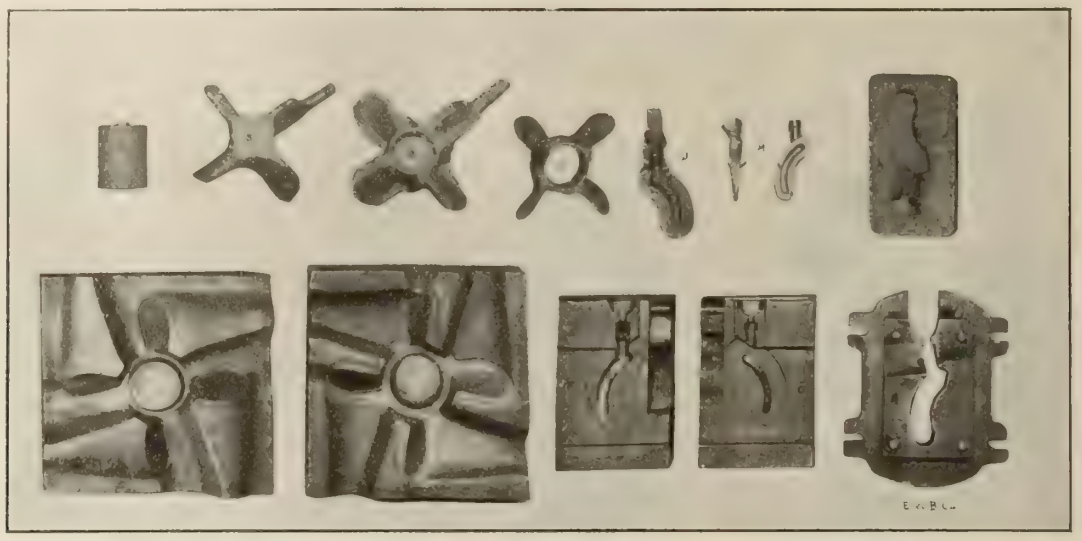


Fig. 1—Drop-forgings and dies for propeller wheel and turbine nozzle.

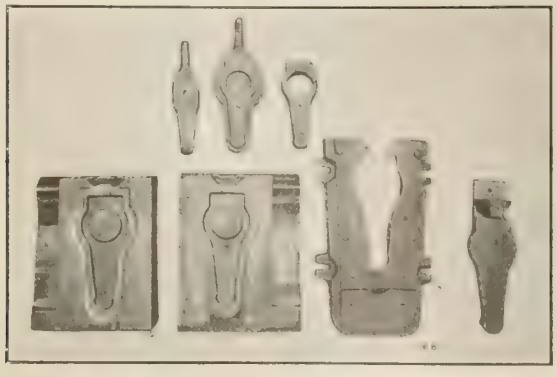


Fig. 2—Forgings and dies for a good-size piece.

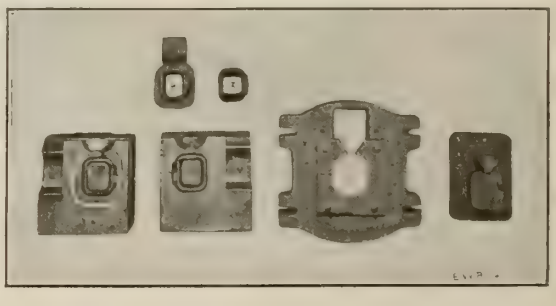


Fig. 3—Dies for drop-forging the piece shown.

broken down between N and O of the forging dies, and changed into the shape shown at P. After this it is drop-forged in the dies shown, and leaves them in the condition seen at Q. The final operation is to trim it in the dies shown at R and S, and these leave it in the shape seen at T, ready for the machine shop.

Bronze Forging.

That bronze can be drop-forged as easily as steel is shown by the piece in Fig. 3, also the dies that are used. This piece, like the steel forgings, is broken down from the solid bar between U and V of the forging dies, and afterwards formed into shape between them, and leaves in the shape shown at W. After this, the flash is trimmed off with the dies X and Y, leaving the forging in the shape seen at Z, ready for machining.

New Drop-Forging Hammer.

The new press made for use on this class of work is shown in Fig. 4. The side frame has been altered in shape; a new mechanism has been devised for adjusting it to position at the bottom; the method of fastening the drop to the board has been changed, and the parts used for taking up wear have also been altered. The operating device is shown in Fig. 6, and the wear on the front roll which in combination with the back is taken up by adjusting screws. The roll grips the board to lift the hammer, method of fastening the board in the drop has been changed so that it is no longer necessary to take a 2½ inch plank and plane the greater part of its length down to 1½ inches in order to get a bevel on one end, only 2 inches long. With the new scheme, a straight plank is used and a tempered steel piece with saw teeth on one side is slipped into the dovetail at the back of the hammer head, along with the lifting board. On the opposite side of the board, a wedge is dropped into place, after which the holding wedge is driven in tight. This causes the saw teeth of the steel wedge in back to grip the board and hold the hammer head.

In Fig. 5 is shown the method of adjusting the side frame. By backing out the set screw and removing two bolts, the entire adjusting apparatus can be removed for replacement or repair. Its method of moving the side frame forward and back can be plainly seen from the illustration.

Strength of Side Frames.

In Fig. 7 is shown the alteration in the sectional design of the side frame, and the greater strength that has been obtained thereby. The strains that are set up in these side frames by the dropping of the hammer, as well as the method of computing their strength, are also shown. When the drop falls in an absolutely perpendicular line, and strikes exactly central, no strains are transmitted to the side frames or uprights of the press. This, however, seldom occurs in actual working conditions, and therefore it is necessary to have side frames of considerable strength. If a 1000-pound hammer, such as shown, drops 30 inches and strikes 4¼ inches away from the centre, and is brought to rest by performing work through a distance of 1-32 of an inch, then a mean force of 158,000 pounds is exerted against the side frame at B, during the time in which the hammer is being brought to rest.

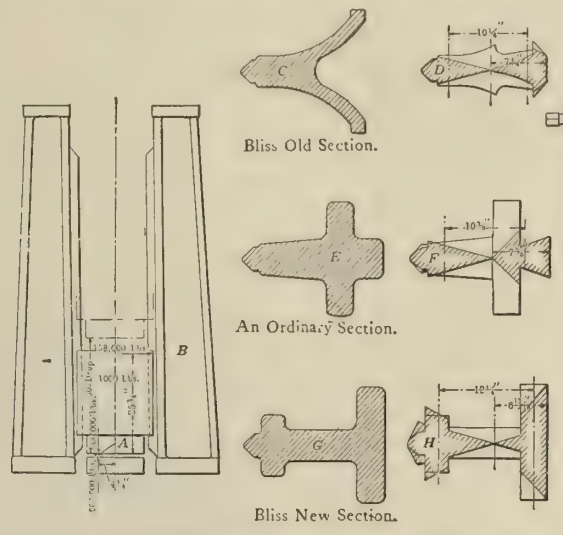


Fig. 7—Types of side frames and their relative strength.

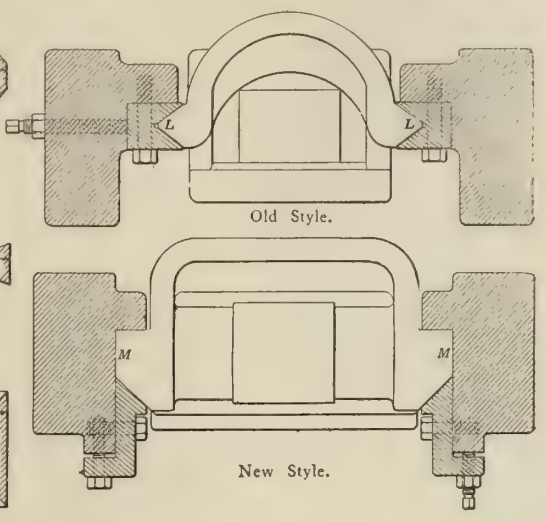


Fig. 8—Old and new style of trimming press frames.

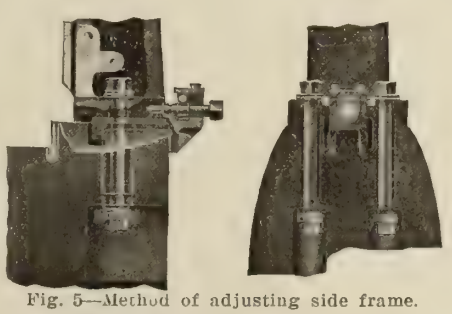


Fig. 5—Method of adjusting side frame.

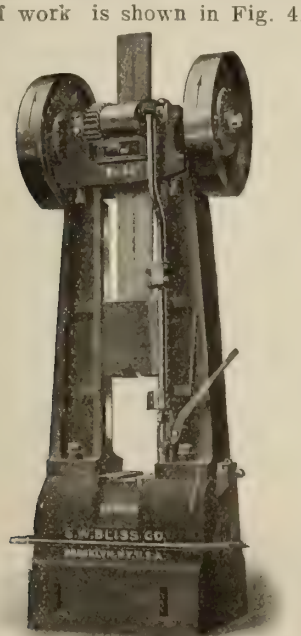


Fig. 4—New drop-forging hammer.

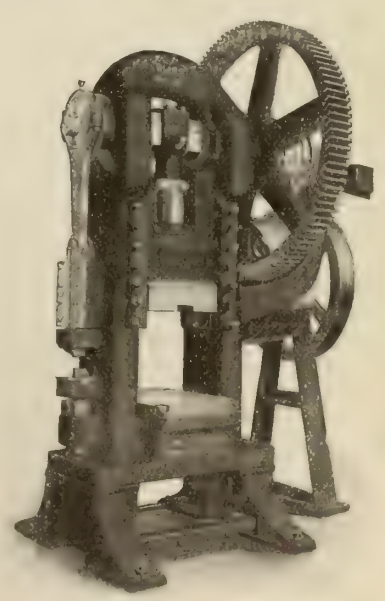


Fig. 9—The new trimming press.

The method of computing the mean force exerted against the side frame is as follows:

Mean force exerted on work in dies

$$\frac{1000 \text{ lb.} \times 30 \text{ in.}}{1\text{-}32 \text{ in.}} = 960{,}000 \text{ pounds.}$$

Mean force sustained by side frame:

$$\frac{960{,}000 \text{ lb.} \times 4\frac{1}{4} \text{ in.}}{25\frac{3}{4} \text{ in.}} = 158{,}000 \text{ pounds.}$$

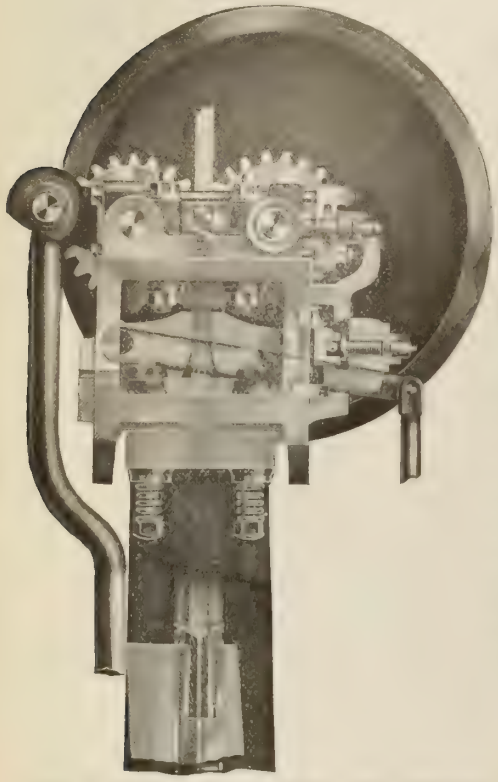


Fig. 6—Mechanism for lifting the hammer.

In the old style of drop-forge hammer built by the Bliss Co., the side frame was given a sectional shape like that shown at C in Fig. 7. In this type, the virtual stress area to resist pressure delivered at B. is shown by the sectional lines in D. Its ultimate B.M.R.=18.34 $\times$18,000$\times$10¼=3,380,000. And in it Z =18.34$\times$10¼ = 188, and I=188$\times$7¼ =1362.

An ordinary section for drop-forge hammers is shown by E. The section of this, to resist the impact, is shown at F. In it Z=27.52$\times$10⅜=236, and I= 286$\times$7⅜=2110. The ultimate B.M.R.= 27.52$\times$18,000$\times$10⅜=5,130,000. A sectional view of the side frame used in the new drop hammer is shown at G. The stress area to resist the impact of the hammer blow is shown by H. For this frame Z=43.07$\times$12¼=528, and I =528$\times$6 13-16=3595. The ultimate B. M.R.=43.07$\times$18,000$\times$12¼=9,500,000.

Comparisons of Strength.

In comparing these, it will be seen that the old style is exceeded in transverse resistance by the later type. In rigidity the old section is also exceeded by the later or ordinary section E. With regard to the value of rigidity, it is worth mentioning that a hammer frame absorbs energy when under side pressure, equal to the pressure times the distance deflected, and that the energy so absorbed, is an appreciable loss. The most rigid frame is, therefore, the most efficient for avoiding this kind of loss and for obtaining the maximum of useful work from the hammer blows.

Trimming Press.

The new trimming press is shown in Fig. 9. This has been altered in numerous places, where better design would give better results. The most notable change is in the form of the guides, and the method of connecting the slide to the crank shaft. The old and new styles of guides are shown in Fig. 8. The V-shaped blocks, as shown at L, used in the old style of press, with their clamping and adjusting screws, are shown in the upper view. The style adopted for the new style is shown in the lower view at M. This consists of a right-angle bearing on one side of the slide, and a bevel bearing on the other, to hold the slide in place and take up the wear. This bevel bearing is held in place by clamping and set screws as shown.

This design gives nearly double the wearing surface of the V-blocks, and is easy to machine. The line cut plainly shows the way the holding piece is put in.

LARGE ROPE SHEAVE AND SHAFT BEARING.

THERE is illustrated in Fig. 1 a rope sheave 8 ft. diameter by 16 ft. 10 in. width of face, 14 in bore, and weighing 66,750 lbs. It was made in four sections with heavy return flanges, and when erected these were bolted together, making a solid, substantial job. It carries 72 wraps of rope, and was designed for 4,000 h.p. at 187 revolutions per minute.



Fig. 1.—Large Rope Pulley made by The Dodge Mfg. Co., Mishawaka.

In order to carry the weight, a hollow shaft was designed with 20 in. bearings, bossed to 24 in. at the sheave hub, and having a 14 in. hole through its entire length of 28 ft. 6 in. That the weight of the coupling might be reduced, flanges were forged at each end of the shaft 30 in. diameter by 2½ in. thick to correspond with the flange couplings of the driven shaft at each end. The finished shaft weighed 24,375 lbs. To carry this enormous weight at the operating speed, a new design of bearing was used. Each mammoth bearing, Fig. 2, weighing complete with the base plate 10,600 lbs., is lined with babbit metal, and has a bearing surface of 20 inches diameter by 56 inches long. They are self-oiling, using two brass rings 1½ in. by ¾ in. to insure perfect lubrication.

The whole outfit, now in operation,

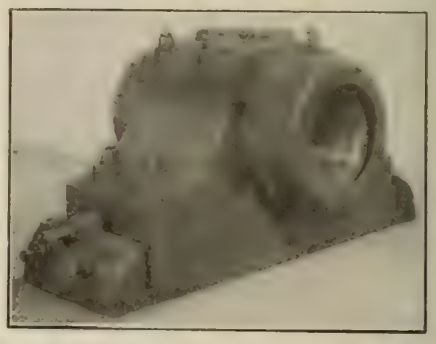


Fig. 2.—Mammoth Bearing made by The Dodge Mfg. Co., Mishawaka.

was furnished to the Pittsburg Plate Glass Co., Ford City, Penn., by the Dodge Mfg. Co., Mishawaka, Ind.

TUNGSTEN DEVELOPMENTS.

A discovery which, it is said, may revolutionize electric lighting was made public recently. It was announced by H. R. Spoorberg, of the British Thomson-Houston Co., that after three years' research work, the company had succeeded in producing tungsten in such a form that it could be drawn into a continuous wire one-thousandth of an inch in thickness, and used in any length or bent to any shape. At the same time its tensile strength had been increased. Hitherto, tungsten has been producible only in short lengths. The new discovery makes it possible to use a continuous wire in a lamp, so that the risk of breakage is reduced to a minimum, and the life of the lamp is considerably extended.

Gas-engine lubrication by "splash" from the crank case is in the same class with hot tube ignition, the old tallow cup on steam engines and the high-wheel bicycle.

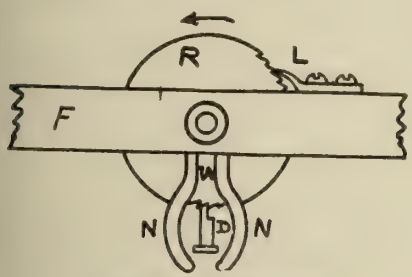
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

THE POWER HACKSAW.

By Donald A. Hampson, Middletown, N.Y.

THOUGH generally regarded as an adjunct, the power hacksaw is or can be made of vital importance in machine shop work. Much of the indifference show can be traced to the lack of a little study or to the idea that the hack-saw is semi-automatic,—regulating itself without attention—to all kinds of work. Fancy such a conception of the lathe or grinder!



The Power Hack Saw.

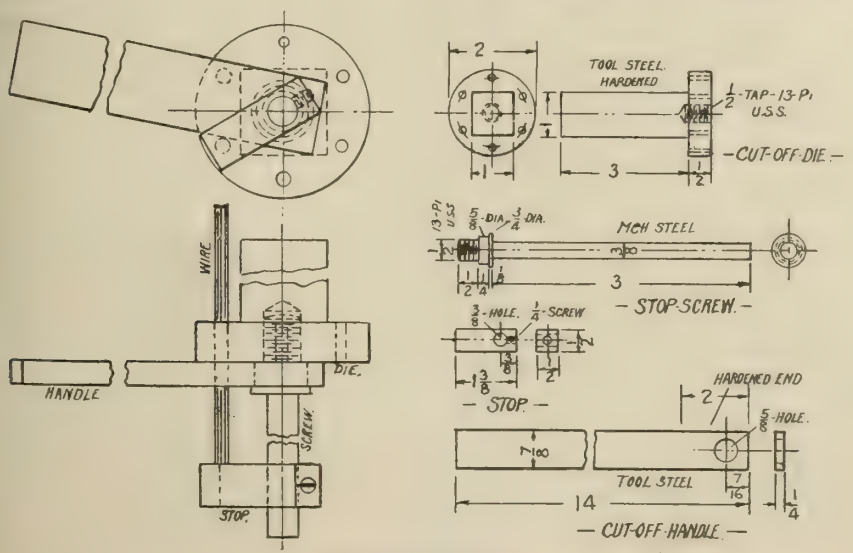
For sawing brass and the softer metals, a much faster feed should be used than for iron or steel; the same applies to pipe and tubing cut in the machine. It is the part of economy, also, to provide blades with finer teeth (not less than 24 to the inch) so that in passing across the thin sections of metal the teeth will not be stripped. In sawing rough castings it is often advisable to mark the cut on the upper side with the edge of a file, thus not only saving the saw the task of scraping off the sand and scale, but forming a definite line for it to start upon. This will go a long ways towards preventing crooked cuts.

Steel and wrought iron give more trouble than other metals, largely in the matter of broken blades, stuck blades, and crooked cuts. Oil is the great panacea for these troubles; not a flood, but a drop or two at the start with repetition if the section is wide or deep, In one case, three or more new blades were put in during every day of steady dry sawing, and when oil was adopted as a lubricant one blade lasted all day and was in good shape at night, with a nice pile of clean straight cuts to its credit. Too often the mistake is made of forcing a cut too much on a bar of steel. In the long run, a moderate feed will sever more pieces from a bar, will require less attention and use fewer blades than will fast feed. The light feed is particularly to be desired at starting.

The Economical Use of Blades.

Have a spacing block for use in the vise of the machine. In cutting narrow pieces the "position" of the stroke is seldom such that the front half of the saw receives the wear, and as a great deal of the work comes in this class, a considerable number of "wornout" blades still boast a half set of full teeth. With a spacing block laid in the back of the vise, the work is thrown to the front when the full length of the blade can be utilized.

It is not the intention of the writer to speak of the loss in efficiency due to run-down physical condition, yet most power saws are given to a defect, after long usage, that is easily remedied and might indeed be applied to new machines with good effect. When the teeth of the ratchet wheel become rounded and the split nut wears or the pawl spring loses its "life," the feed is apt to become spasmodic, and at each stroke the pawl carries the wheel backwards a tooth or two. Often this occurs at but one point in the screw's revolution, the saw running several minutes without feeding. In the drawing F is the saw frame, R the ratchet wheel, N the handles of the nut, and D the pawl. L is a latch screwed to the frame—its end, light and spring tempered, lightly engages the teeth and prevents back motion without excessive wear. With the pawl spring stiffened, the full feed is realized.



Hand Wire Cutter.

HAND WIRE CUTTER.

By J. E. Cooley, Hartford, Conn.

A simple and inexpensive hand wire-cutter which can be made from materials already in the shop is shown in the enclosed sketch. The only adjustment required in its use is the stop for cutting different lengths of wire. It will cut any size of wire from No. 0 to $\frac{1}{8}$ inch diameter, and in lengths from $\frac{3}{4}$ up to $2\frac{1}{2}$ inches, at the rate of 150 a minute. The end of the die-cutter is milled 1 inch square, so that it can be gripped in a vise when in use. The wire is hand fed to the stop, through any of the holes in the die-cutter, and is cut off by pulling the handle down. The handle is hardened for about 2 inches on the cutting end, so that the edge will not wear. The drawing shown here is so plain that no further explanation is necessary.

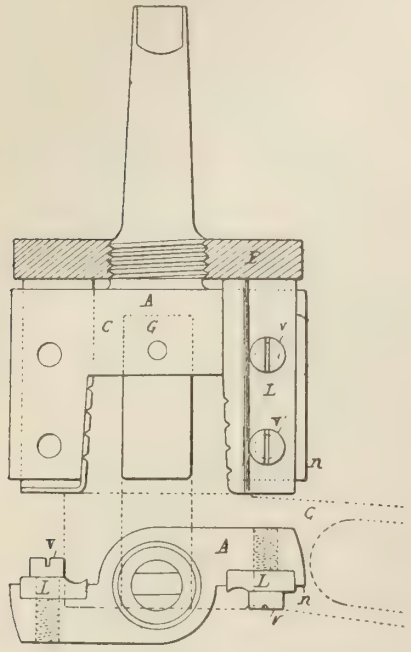
CONICAL TURNING ON THE DRILL PRESS.

From La Machine Moderne.

HAVING to machine some automobile wheel seats as shown at C, and the turning of the conical part being impossible except on a large gap lathe, I had to do the job on a drill press. My first idea was to mill it, but the size of the work would not allow of a complete revolution of the table, and by milling part of it at one time and then re-setting the work, much delay would have been occasioned and a poor finish obtained.

I made up the tool-holder, A, with a taper shank to fit the drill press, and carrying on the arms two cutters, L, of high-speed steel. The cutters are held in their correct position transversely by the check seen at N. The thrust collar, E, allows of their vertical adjustment

and at the same time prevents them from rising. The cutters are further secured by the screws V.V. The pilot G is hardened and ground, and held in place by a pin in case it should have any tendency to stick. The notches in the two cutters are not opposite each



Conical turning on a drill press.

other; their purpose, of course, being to break up the chips.

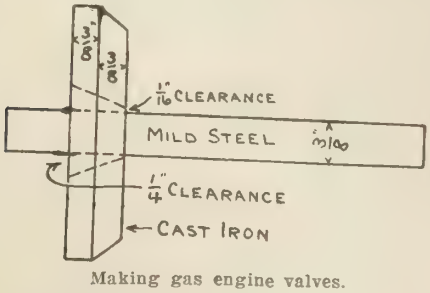
This tool turns out the work perfectly true and with a finish equal to that obtained on a lathe.

MAKING GAS ENGINE VALVES.

By L. C. D., Montreal.

GAS engine valves are often wanted with cast iron seat and mild steel stem, in which case a casting is made for the seat as shown. The stem, a mild steel bar of required size, is taken and welded to the seat as follows.

The seat, with the large end of the conical hole upwards, is placed on an iron plate having a hole in it, through which the stem is put and adjusted by hand until the upper end is about ¼ of



Making gas engine valves.

an inch above the seat surface. Application of the blow pipe fuses the end of the stem which flows down and fills the conical hole, giving a strong weld capable of withstanding considerable shock.

A DRILLING JIG.

By A. P.

HAVING a number of small engine connecting rods to make, whose cylinder piston clearance was not to exceed 1-32 inch, it became necessary to have them conform exactly to the drawing centre, and at the same time be interchangeable.

To obtain this, I arranged for the drilling and reaming of the gudgeon pin hole to be the last process, then, having the crank pin end finished, and the piston end machined to width, I made the jig as here described, taking advantage at the same time of the centres put in for turning the crank pin end.

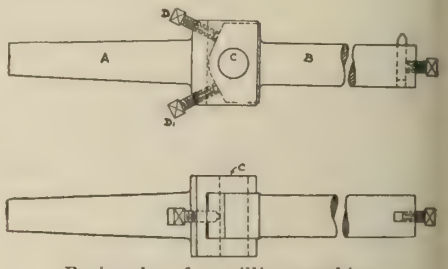
The jig consists of a flat wrought iron base plate A, at the right hand end of which a rectangular groove is cut across to locate a cast iron bracket B, by means of a strip machined to fit, and held in position by two set screws. This bracket is fitted with an adjustable screw, whose case-hardened conical end engages the centre in the rod. The face C is slotted or milled to the correct height from the centre of this screw, being equal to half the thickness of the rod. On the top of the bracket, a hole is bored concentric with the rib on the under side to receive a hardened tool steel button, which acts as a pilot for the drill, etc. At the left hand of base plate is a turned peg, held in place by set screw D, and located by the spigot on the under side, which fits a recess bored in the plate. The peg is turned to fit the large end of the rod, and has a shoulder E formed upon it to keep the centre line of the rod parallel, and, therefore, square to the drill and reamer.

The jig is now clamped down on the drill press table, and when the rods come to be drilled, the large end is slipped over the peg, then swung round into position and held there by the square ended adjustable screw, all ready for the usual process of drilling and reaming.

BORING BAR FOR MILLING MACHINE.

By H. E. Fozard, Ottawa.

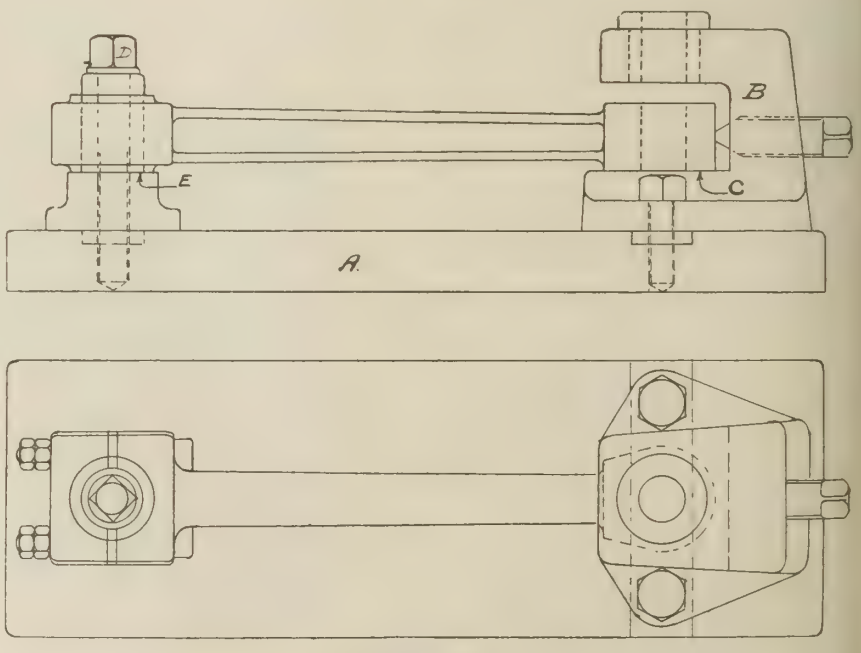
THE accompanying illustration shows a simple, inexpensive and useful boring bar for the milling machine. In the small machine shop handling general work with a limited plant, it is of exceptional service on jobs too large to swing in the lathe, or for those of irregular shape. I have used it with



Boring bar for milling machine.

much success in boring gasoline engine cylinders.

A, the shank to fit milling machine spindle, has a slotted end. Pin C is a tight fit, and upon it the tool bar B swings. Depth of cuts taken are regulated by set screws; thus, by slackening D and tightening D_1, the radial course taken by the cutting tool is enlarged.



A drilling jig.

PREVENTING OF TAPS FROM BREAKING.

THE sketch, reproduced herewith, shows a handy kink to prevent taps from breaking. It is discouraging when tapping out a small hole in a piece of work to have the tap break off in the hole. In most cases, this means annealing the broken part before it can be drilled out. To avoid this difficulty, cut a line parallel with the shank of the tap, as shown in the drawing, and heat it half way between the threads and shank end, to a light blue color.



A tap which gives warning of undue strain.

This will obviate the breaking of the tap, as the shank will twist before it will break, and the line will show that it is twisting, thus giving the user warning. Needless to say, this has proved to be a very valuable little kink on small taps.—Scientific American.

INSERTED BLADE TOOLS.

By Chas. Hattenberger, Buffalo.

OWING to its cost, not a few manufacturers hesitate to use high speed steel on some of their tools, such as reamers, taps, counterbores, etc. One suggested solution to their problem is the use of tools with inserted blades held in a suitable holder.

Fig. 1 shows a taper reamer with blades held by means of wedges. A is the body which has slots milled in it for the blades C ; an equal number of slots are also milled to accommodate the wedge D, the taper of which is ½ in. in 12 inches. B is a case-hardened thrust collar with holes drilled for spanner wrench. To assemble this tool, screw thrust collar down firmly against shoulder and insert blades against the collar. The wedges are then driven tight by means of the drift shown. This tool, if properly made, will stand a tremendous amount of hard usage, and after being dulled, can easily be reground to the correct size by placing shims made of tin or brass under the blades. If the ends of the blades are sharpened, it may be used on cored holes, cutting a very smooth hole.

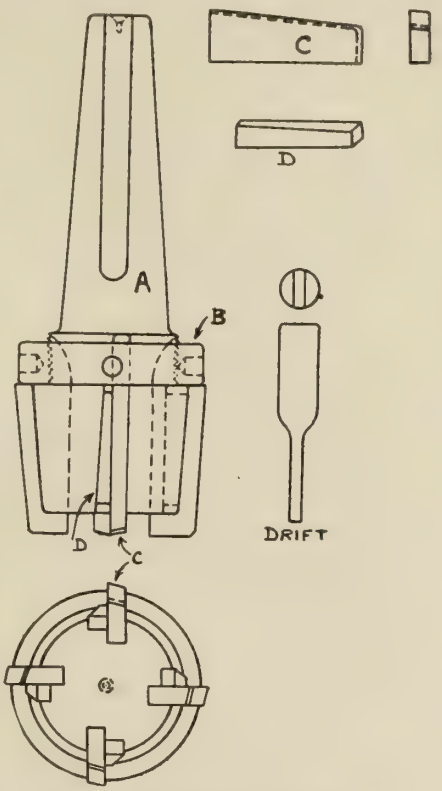


Fig. 1—Inserted Blade Tools.

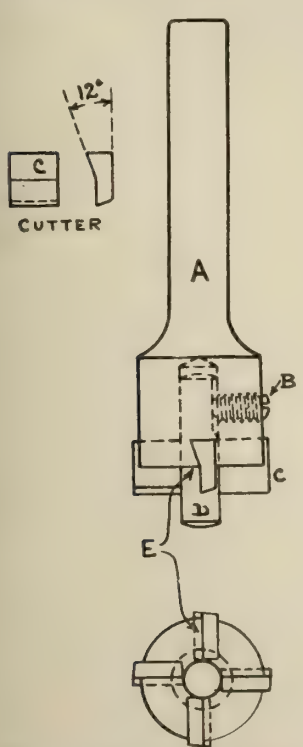


Fig. 2—Inserted Blade Tools.

Fig. 2 is a facing tool which consists of body A, having a hole drilled in its centre for pilot D, and four slots for cutters C. These slots are cut in the shaper. The cutters have one side inclined at an angle of 12 degrees and should fit snugly into the slots. They are held firm by caulking at point E. A set screw for holding the pilot is shown at B. A drill may be substituted for the pilot. If used with ordinary care, it should last a long time ; it is, however, not adapted for heavy cuts. In sharpening take out the pilot.

A straight reamer having long blades is shown in Fig. 3. The body A is shown with five slots milled in it for the blades; it is also threaded to receive the thrust nut B and collar C, which serve to jam the blades down upon the thrust cap D. Five slots are milled in the face of D at an angle of 60 degrees. E is a countersunk head screw with a square milled for a wrench. It also has a countersunk hole on top to be used as a centre in grinding. After the blades become worn it is only necessary to place shims under them and grind back to size. F shows one of the blades.

Fig. 4 shows a two-lipped tool which was used to rough out a drilled hole prior to finishing with a hand reamer. A is the body which has a slot through its centre to receive the cutter B. The slot was formed by drilling a series of holes, chipping out the core and filing. The cutter has a slot through its centre and has a taper hole to admit the adjusting screw C. A taper pin D holds the cutter in place. The portion E may be left on, if so desired, to act as a pilot.

A tap with inserted blades is shown in figure 5. Four slots are milled in the body A, to receive the cutters B. The cutters are held by means of two pointed setscrews, D. The screw points engage the countersunk holes in the blade at a point a little above and a little to the left of the centre, as shown at E. When tightening the screws, the blade is forced against the bottom of the slot and also against the thrust collar C. Care must be observed so as to mill the slots radially. F is a recess 1-16 inch larger than the size screw used. Thrust collar C, as well as the setscrews, must be case-hardened.

A combination drill, countersink and recessing tool is shown in Fig. 6. This tool was used in the centering machine to countersink and recess the ends of

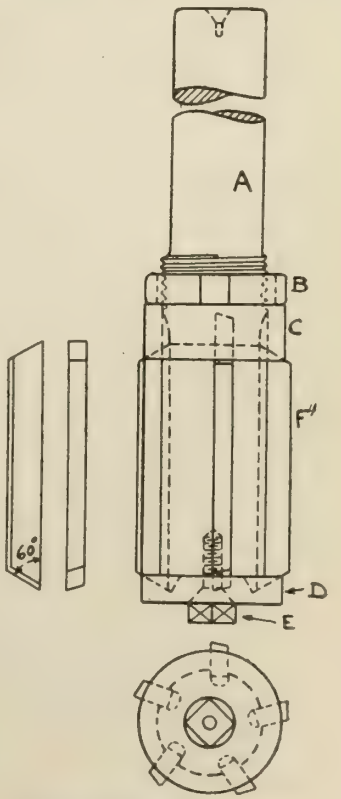


Fig. 3—Inserted Blade Tools.

shafts as shown at A. It consists of the body B with a slot milled in it for the blade C, and threaded about half way down, for the split collar D which takes the thrust, the blade being secured by the split collar E. The rest of the sketch explains itself.

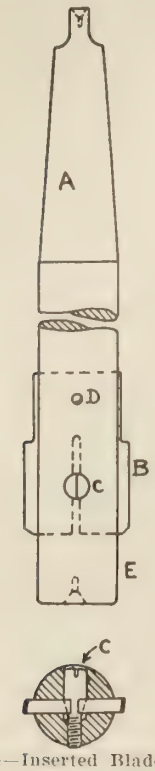


Fig. 4—Inserted Blade Tools.

At Fig. 7 is shown a reamer used for holes of large diameter. The body A is acts as a thrust collar. The blade C is first turned complete in the lathe, then slots are milled for the cutters B, which

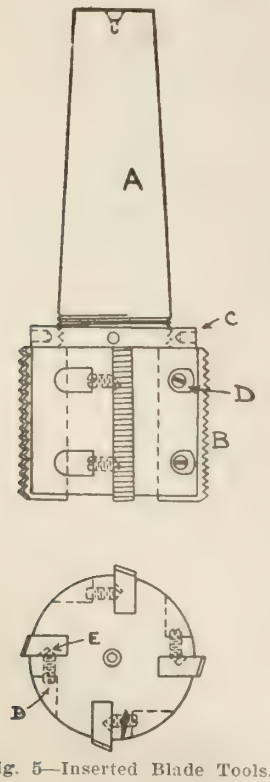


Fig. 5—Inserted Blade Tools.

are held in place by fillister head machine screws. The body containing the blades is again put in the lathe and turned off to within .010 inches of the required size. After this operation the angular flutes C are milled and then using another angular cutter, the flutes D are milled. Care must be taken to mill the cutting faces radially. The blades are next taken out and hardened, after which they are again inserted in the holder and ground to the correct size.

SPACING CIRCLES.

By H. E. Fozard, Ottawa.

IN the course of my experience in the machinist business, I have found very few workmen capable of setting their dividers for spacing circles, without having to try round the circle several times, and thereby wasting valuable time. The following formula is an accurate and simple method, which will enable the machinist to set his dividers correctly first time. Sine of

$$\text{Sine of } \frac{360 \text{ degs.}}{\text{number of spaces} \times 2} \times$$

inches diameter of circle to be spaced. For example, a circle 10 inches in diameter to be equally spaced for 9 holes.

$$\text{Sine } \frac{360 \text{ degs.}}{9 \times 2} = \text{Sine 20 degs.}$$

By looking up a table of trigonometrical ratios to be found in almost all machinists' books, we find Sine 20 degs. =.342, which, multiplied by the number of inches diameter of circle, namely 10 inches, gives 3.42 inches as the dimension to which to set the dividers.

READER, WHAT DO YOU KNOW?

Among readers of Canadian Machinery there is a clearly defined sincerity of desire to know how each overcomes the daily tasks of the machine, pattern and blacksmith shops, the foundry and boiler shops. It is believed that your methods and devices, while good, may be improved, and thereby made more valuable if you publish them, so that other brains may work on them. We will provide the setting and pay you for the material. When your fellow tradesman puts the superstructure on your foundation, we pay him and pass the "kink" on to you, free. Get into the game.

VANADIUM STEEL CASTINGS.

Steel castings containing vanadium should never be used without annealing. In the unannealed state they are more brittle than plain carbon-steel castings. In annealing vanadium steel castings, it should be observed that a somewhat higher temperature is required than is used when annealing ordinary steel castings. A temperature of at least 1,500 degrees F. is necessary, and it is preferable that a temperature of 1,560 degrees F. be used. Rolling mill pinions made from vanadium steel castings have proved to have from two to three times the life of carbon-steel pinions and from one and a half to two and a half times the life of nickel-steel pinions.

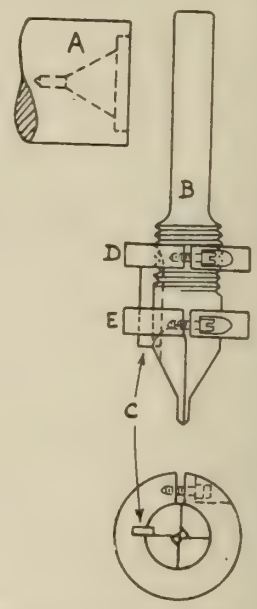


Fig. 6—Inserted Blade Tools.

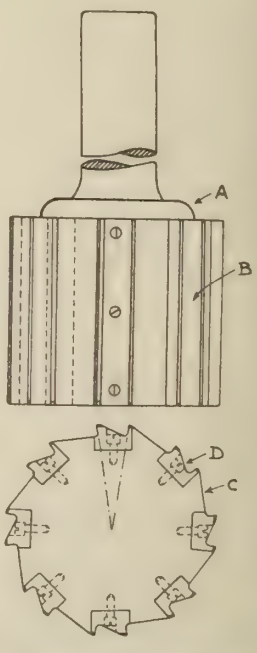


Fig. 7—Inserted Blade Tools.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

PAPER FILE HANDLE.

THE cut shows the indestructible paper file handle placed on the market by Schuchardt & Schutte, Coristine Building, Montreal. Its features are that it does not split, wears well, and being perfectly smooth, ensures against sore hands or splinters.



The indestructible paper file handle.—Schuchardt & Schutte, Montreal.

SEARCHLIGHT UNIVERSAL LAMP BRACKET.

THE question of good light, in the machine shop, draughting room, and in fact every department of the factory, is one which is receiving an increasingly prominent degree of attention, and everything tending towards that attainment which brings more comfort to the operator, lessens the danger of accident, ensures higher quality and greater output is more or less educative, valuable and welcome.

The "Searchlight Universal Lamp Bracket," which we illustrate, is designed and manufactured by the Mc-

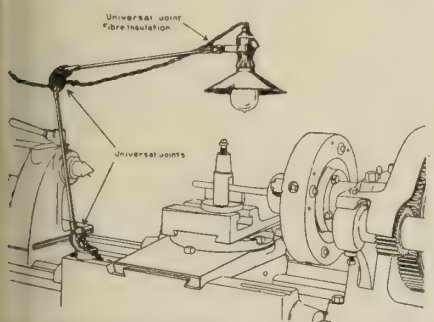


Fig. 2—Searchlight Universal lamp bracket—lathe attachment.

Crosky Reamer Co., Meadville, Pa., with a view to satisfying the foregoing conditions.

Figs. 1 and 2 show the apparatus with style A bracket attached to a wall and to a table respectively. Other applications with style B, C and D brackets are specially adapted for floor, bench, ceiling, drafting, lathe and desk attachment. The searchlight combines such features as being absolutely universal, instantly manipulated, easily installed, adaptable to all places and conditions, insulated, rigid, neatly finished, light and compact.

The universal joint consists of friction discs so arranged as to give both horizontal and vertical movements.

Between each pair of discs is a friction washer, and the amount of friction is regulated by screws and lock nuts, which hold the friction uniform at any desired tension. The arms are of solid steel, and the discs are malleable iron machined to a perfect bearing on the friction washers between. All the brackets are 30 inches long, with the exception of style D, and give a range of 5 feet. They are plated by an electro-galvanizing process, which gives an aluminum finish, rust proof and pleasing to the eye.

THE SIBLEY ALL-GEARED DRILLING MACHINE.

EXCLUSIVE features of this new box column all-geared drilling machine, built by the Sibley Machine Tool Co., South Bend, Indiana, are the direct drive, the speed box being located on top of the column, and the elimination of every part not absolutely necessary and not affecting its range and convenience. Further, all gears are enclosed and run in oil, while all bearings have self-oiling devices. In operation, this machine has been designed with a view to convenience. It can be started or stopped, feeds and speeds changed, and table adjusted by the operator without moving from his position in front of the press.

The speed box is located in the logical place on top of the column, which necessitates the use of only one pair of bevel gears to deliver the power to the cutting tool. Any one of the eight speeds can be selected instantly without running through intermediate changes. The semi-steel feed gears are always in mesh, and changes are effected by means of a patented internal key which will not stick or bind. Six long split bushings of special bronze, with 97 square inches of bearing surface, carry the main gear shafts. These latter are of high carbon steel. The entire mechanism runs in an oil bath, insuring constant and thorough lubrication. Hoods at the ends of the bearings catch the surplus oil, which returns to the case through large drains.

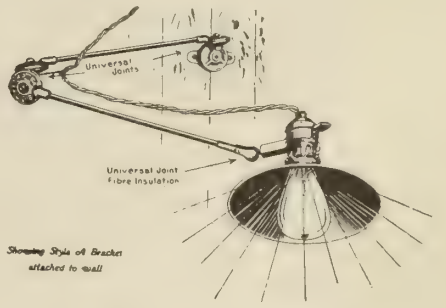
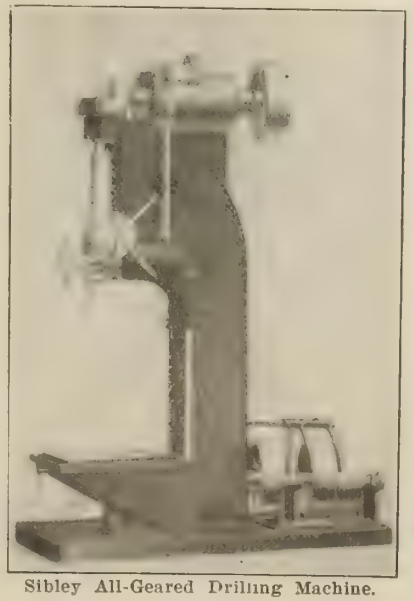


Fig. 1—Searchlight Universal lamp bracket—wall attachment.



Sibley All-Geared Drilling Machine.

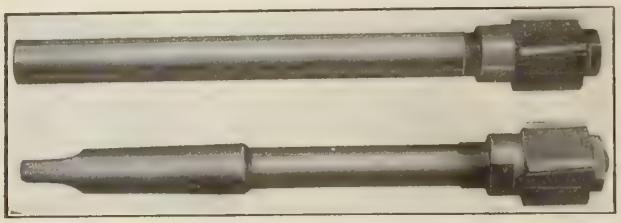
The spindle, of high carbon steel, is finished by grinding, as is also the graduated spindle sleeve. The spindle runs in two bronze bearings, which are equipped with self-oiling devices. A ball thrust collar is supplied, and guaranteed not to crush under the most severe service. The feed mechanism derives its power from the main drive shaft, which directly rotates the spindle and is geared down in such generous ratios that an unusually powerful feed is obtained. There is only one pair of steel bevel gears in the entire feed; these, together with all feed gears and the steel worm, run in an oil bath.

Four changes and a neutral position are obtained by moving a small knob in the centre of the hand wheel. A positive adjustable collar on the graduated spindle sleeve trips a latch at the desired depth of hole, and the entire mechanism swings down from the worm gear on a large hinge pin. A special wear-resisting bronze alloy is used in the worm gear.

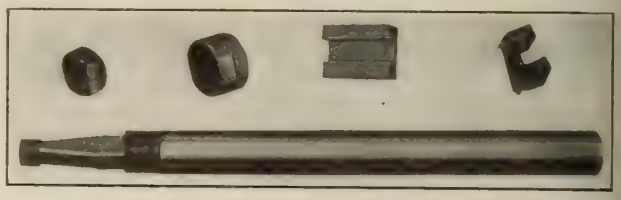
Absolutely every gear on this machine is enclosed and running in an oil bath. The countershaft bearings, as well as spindle bearings, are equipped with self-oiling devices, and a self-oiling loose pulley is supplied which will run several months without attention. Another exclusive feature is the pump and tank for supplying lubricant to the cutting tool. Tank, pump and all pipes are enclosed within the column, and the cutting compound returns to this tank through a drain in the table which is not visible outside. By this means the machine can be kept neat and the compound free from chips and dirt.

The design, it will be noted, is unusually heavy and compact throughout. There are no exposed moving parts beyond the pulleys and spindle, and everything has been designed to carry many times the load guaranteed, namely, to drive the best high speed drills from $\frac{3}{4}$ up to $1\frac{3}{4}$ inches at their most efficient speeds and feeds. The specifications are given herewith :

Swing, 24 in.
Maximum distance, spindle to table, 27 in.
Feed of spindle, 12 in.
Feeds per revolution of spindle, .008 in., .015 in., .024 in., .032 in.
Smallest diameter of spindle, $1\frac{3}{4}$ in.
Diameter sleeve, $3\frac{3}{8}$ in.
Morse taper hole in spindle, No. 5.
Working surface of table, 16 in. x 20 in.
Vertical traverse of table, 20 in.
Diameter of all pulleys, 13 in.
Face of all pulleys, $4\frac{1}{2}$ in.
Spindle speeds, 75 to 450 R.P.M.
Countershaft speed, 400 R.P.M.
Height over all, 6 ft. 10 in.
Weight, 2200 lbs.
Floor space required, 29 in. x 57 in.



The "Ideal" adjustable high-speed reamer.



The "Ideal" Reamer Parts.

A NEW STYLE LATHE DOG.

THE West Steel Casting Co., Cleveland, Ohio, have brought out an improved type of lathe dog designed to afford all possible protection to the workman. As may be seen from the cut, the top of the dog is in one piece, covering the set screw making it impossible for the lathe hand to catch his sleeve in the revolving work, as so often happens with the old style dog with no screw protection. An ordinary standard wrench is used on the set screw for adjustment, and should the latter become damaged or burred, it can be removed by placing a socket wrench through the top hole.

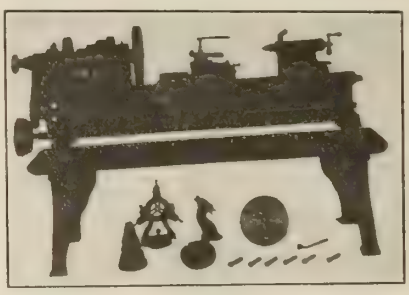


New style lathe dog.

The dog which may be had with either a bent or straight tail, is made of crucible cast steel having a tensile strength of 70,000 pounds per square inch. The set screw is of high grade steel and has its end hardened.

NEW 14-INCH LATHE.

THE illustration shows a new 14 inch lathe now being built by the Miami Valley Machine Tool Co., Dayton, Ohio. It has strength, accuracy, and simplicity, and is designed to meet the demand for machines to be used in manual training schools, auto garages, as well as general manufacturing plants. The actual swing, over the bed, is $14\frac{1}{4}$ inches and the hole through spindle which runs in large phosphor bronze bearings is 1 1-16 inches. The carriage has three bearings on the bed, the third bearing giving additional strength to the heavily ribbed cross bridge. All bearings are hand scraped. The machine can be equipped with draw-in spindle, collets, and taper attachment, thereby making a high grade tool room lathe. It can also be furnished with regular style legs without oil pan.



14-in. Lathe—The Miami Valley Machine Tool Co.

The usual equipment is furnished with each machine.

ADJUSTABLE HIGH SPEED MACHINE REAMER.

THE Ideal adjustable high speed machine reamer made by the McCrosky Reamer Co., Meadville, Pa., is designed to ream with ease the toughest, hardest and most fibrous metals, without binding, heating or clogging up with chips, and to leave every hole true and smooth and round. This reamer differs radically in construction from other adjustable types, there being only two solid blocks of high-speed steel held on an arbor by two powerful collars—nothing more; screws, small parts and inserted teeth being notable absentees in this tool.

There are four left hand spiral cutting edges, and every tooth is milled in the solid head. Adjustment is effected by loosening the rear collar and tightening the front collar, which procedure forces the two halves of the reamer head up the inclined surfaces of the arbor, obviating the necessity of shimming with paper or sheet metal.

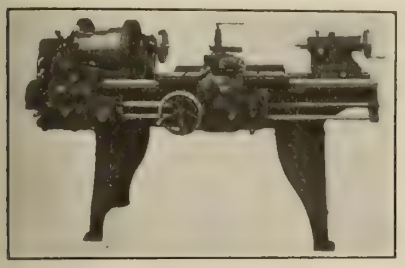
If desired, these reamers are furnished with right-hand spiral flutes for roughing purposes.

THE MORRIS NEW 16-INCH LATHE

THE accompanying photographs illustrate a new 16 inch quick change engine lathe recently placed on the market by the John B. Morris Machine Tool Co., Cincinnati, O. The machine, while conforming in general to the practice of the leading lathe builders, has a number of novel features incorporated in its design which go to increase the productive capacity of the machine. The tool is designed for heavy duty service and characterized by great driving power together with strength in details to balance same.

The driving cone, which is 3-stepped has diameters $7\frac{1}{8}$, $8\frac{5}{8}$ and 10 inches respectively for a $3\frac{1}{2}$ inch driving belt. The back gears are of the double fri

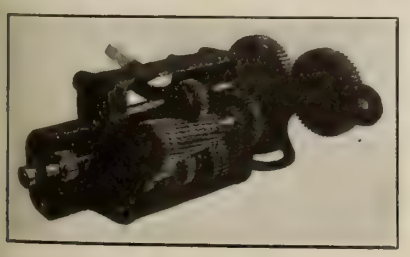
tion type with ratios sufficient to give ample pulling power on large diameters. The frictions in these back gears are of the toggle lever type, unusually large in diameter, and are fitted with an automatic adjustment for wear. The spindle boxes, made of phosphor bronze, are oiled continuously from large oil wells in



The Morris New 16-in. Lathe.

the pedestals. The front spindle bearing is $2\frac{3}{4}$ inches diameter by $4\frac{1}{2}$ inches long. The headstock is reinforced with an improved system of dropped longitudinal and cross ribs down below the shears of the bed. The reverse plate is carried on the outside of the head, and is a double-walled one-piece casting in which the studs for the gears are supported at both ends.

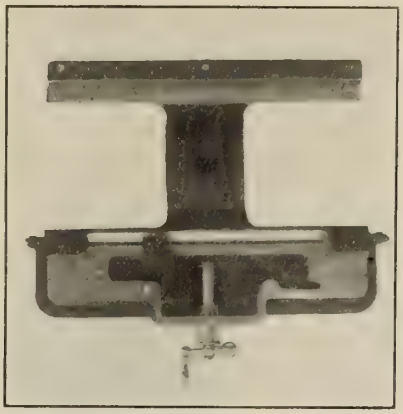
The quick change gear mechanism consists of the usual cone and tumbler gear combined with a novel system of sliding gears through which 45 changes of feed or thread leads are obtained with the use of 21 gears. All feed changes are obtained by means of the three levers shown on the front of the box, the one at the left being used only to secure the extreme range. The total range of the machine is from two to sixty threads per inch. The end of the lathe is fitted with the usual quadrant and quadrant gear for connecting up with the spindle, so that it is possible to put on change gears to secure any special thread which might be required within the above range, and making the machine capable of covering as wide a range of threads as can be obtained on any standard construction of engine lathes. A new feature in connection with this mechanism is the method of connecting it with the feed rod and lead screw. This is accomplished by means of a sliding gear operated by the knurled handle shown at the extreme right of the box, and is so arranged that when the lead screw is in operation the feed rod is at rest and



Detail—The Morris New 16-in. Lathe.

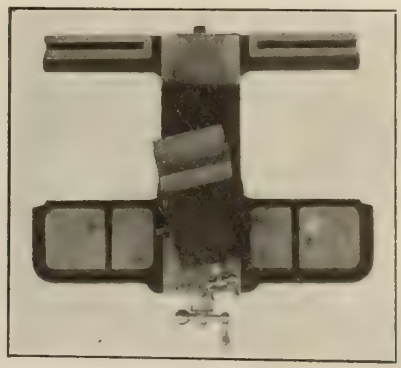
vice versa. This construction makes the quick change box a complete mechanism within itself and permits it being taken off the bed without disturbing the adjustment of the lead screw or feed rod. The apron is a one piece box section casting with all studs and gears supported in bearings at either end. It is supplied with the usual bevel gear reverse, which mechanism interlocks with the half nut, so that it is impossible to engage the lead screw and feed rod at the same time.

To overcome the difficulty usually encountered in engine lathes due to the operator's inability to manipulate the revolving knurls for engaging feeds, owing to the high speed at which they revolve, a novel arrangement of clutches is employed. The frictions are of the



Detail—The Morris New 16-in. Lathe.

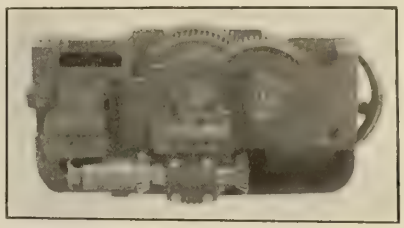
expanding ring type 5 inches diameter and engaged by means of a toggle lever movement which insures ample driving power under the heaviest cuts. The shifting mechanism for these frictions consists of a single crank handle shown on the front of the apron. When this lever is thrown to the right it engages the longitudinal feed, and when it is thrown to the left it engages the cross feed. Since this lever is stationary at all times it enables the operator to work up to a shoulder without the ne-



Detail—The Morris New 16-in. Lathe.

cessity of throwing out the feed and running up the carriage by hand, and in addition to this, it is in a particularly convenient position for the operator to manipulate at all times. Provision is made in the shape of a positive stop which makes it impossible to throw the lever from one feed to the other without first pulling out the plunger pin in the handle.

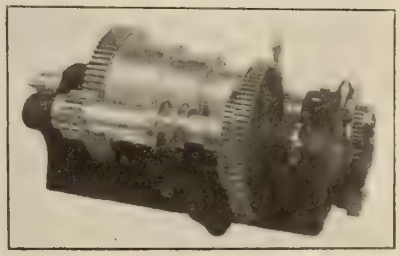
The carriage, which has a bearing $26\frac{1}{2}$ inches long on the bed, is carried on a



Detail—The Morris New 16-in. Lathe.

"V" at the front and on a flat surface at the back of the bed. It is held in position by a long flat clamp at the back and by means of two taper gibs at the front which bear on the machined surface directly under the front "V". These gibs from their location make it impossible for the carriage to lift or climb the "V" under any conditions, and at the same time will not throw the carriage out of alignment if not properly adjusted. The front "V" is unusually large, being $1\frac{1}{2}$ inches in width, and with the wide flat bearing at the back gives the carriage a total effective bearing area of from two to three times that usually found on lathes of this size. The bridge is very wide and drops down in a deep double box section between the shears. Since the ways for the tailstock are dropped down below the ways for the carriage, it is not necessary to notch the bridge for clearance, and thus its rigidity is maintained.

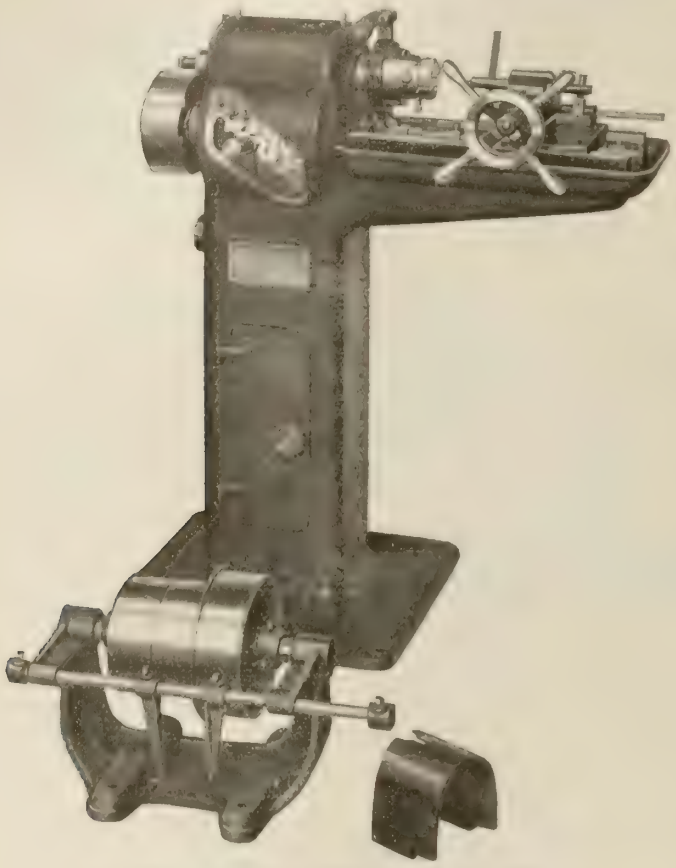
The compound rest is made heavy to withstand the strains imposed upon it by the modern high speed steels. The clamping device for the swivel is of a new construction operated by a single belt which is located convenient to the operator. The clamping mechanism consists of a "V" shaped clamping ring of a similar construction to that usually found on round column radial drills. This device in addition to being very effective leaves the bottom slide more rigid than it would be with the "T" slot turned in it and at the same time permits of very quick adjustment of the



Detail—The Morris New 16-in. Lathe.

compound rest. The tailstock is of massive box section and arranged with the usual type of set-over for turning tapers. Its spindle is of steel 2 3-16 inches diameter, and is clamped by means of a taper plug of the same construction as that usually found on the overarm of a milling machine. The tailstock is clamped to the bed by means of two large bolts coming up directly in front of and behind the tailstock spindle. These bolts reach to the top of the tailstock, where the nuts are in a convenient place for the operator.

The bed is 11¾ inches deep and 14½ inches wide, strongly ribbed with cross girths. The front girth, which is directly under the front spindle bearing, extends clear up to the top of the ways in order to resist the twisting strain on the bed at this point. The legs are set in from the ends of the bed, thus shortening the span between supports on the bed and making use of the familiar cantilever form of construction. The feed gears throughout the machine are made of steel and are considerably heavier than those usually found in similar machines; the lightest gear in this mechanism being 9 diametral pitch. That the machine is capable of continuous operation under heavy cuts, will be evidenced by the statement that it will handle, without any signs of distress, a cut ¼ inch deep by ⅛ feed in 60 point carbon steel at a peripheral speed of 75 feet per minute. The lathe swings 16½ inches over shears and 10 inches over the carriage, and with a six foot bed takes 2 ft. 8 inches between centres. With a six foot bed, the approximate weight is 2,100 pounds.



Geometric threading machine complete with countershaft (oil hood removed).

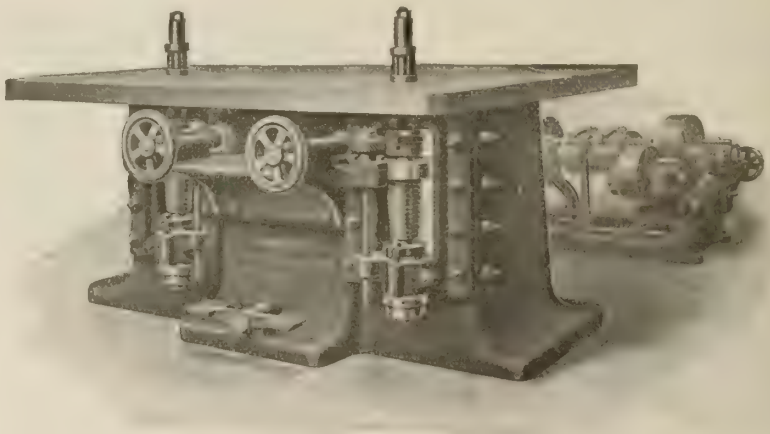
GEOMETRIC THREADING MACHINE

THIS machine has been especially designed to thread work that cannot be produced on the usual screw machine or turned out economically otherwise. It is intended to produce accurate work in quantity and should not be confused with bolt-threading machines generally. The pedestal and arms consist of a single heavy casting, through the head of which a hollow spindle of liberal diameter is mounted on bronze sleeve bearings. At its inner end, this spindle carries the standard Style D, Geometric Self-opening and Adjustable Die-heads, modified in design to meet the changed requirements of operation.

The die-head is held in a heavy cam sleeve pivoted in a yoke hung from the housing of the spindle. At its lower end this yoke is attached to a closing rod equipped with two adjustable stops. The forward stop is set to trip the die-head open, upon the completion of the thread, thus allowing the quick withdrawal of the work. The rear stop serves to re-close the die-head when the carriage is pulled back against it. This carriage is mounted on slides and is designed to be moved back and forth by hand. It carries a vise operated by hand wheel, and while designed particularly for rod threading, can be adapted to thread pieces of special form, simply by fitting it with a vise design for holding the work.

A liberal sized oil well is placed a short distance below the spindle in the pedestal, and carries an oil pump of the gear type driven by a round belt. This pump forces oil through the hollow spindle and at the opening on the die-head on the work, the oil returning to the well through a fine screen.

The range of the Geometric Style D Self-opening and Adjustable Die-head, with which this machine is fitted, is from ¼ to ¾ inch. Sizes obtainable are: ¼, 5.16, ⅜, 7-16, ½, ⅝ and ¾-inch, the machine being equipped with a change speed gear for adapting the speed of the spindle to the diameter of the work to be threaded. This gear is operated by a short lever dropping in notches corresponding to the various speeds, as shown by the illustration. An adjustable stop is provided at the off side of the carriage for gauging the length of



Fay & Egan extra heavy double-spindle shaper

the work. This is employed as a gauge in setting the work in the vise, and insures a uniform length of thread in every piece. A removable oil-guard placed over the die-head prevents it from throwing the oil about.

The range of diameters mentioned is obtained by the use of extra chasers or dies. To remove the chasers, push the carriage forward until the stop opens the die-head, exactly as when in operation. The chasers then may be readily lifted out by holding up on the knurled nut on the small projecting stud of the die-head. The form of the chasers is such that they are long-lived, and when worn out, may be replaced at a nominal expense.

The various speeds at which the Geometric Threading Machine has been designed to run for different diameters, are the result of a number of years' experience in this work.

EXTRA HEAVY DOUBLE SPINDLE SHAPER.

WE are glad to be able to call attention to another new J. A. Fay & Egan Co. machine. This new tool is a double spindle shaper, designed to meet the most exacting requirements of car shops, and all kinds of woodworking plants, where heavy shaping is done. In the company's large illustrated circular treating of this machine, particular attention is called to the extreme high speed of the spindles, insuring perfect work and maximum output. The phosphor bronze taper bearings with continuous oil flow, permit the operation of the spindles on this machine at 7,000 revolutions per minute. The spindles are made of forged crucible steel, and mounted in rigid housings, which are fitted into planed gibbed ways, throughout their entire length. These housings, adjustable vertically by hand wheel (as will be seen in the illustration), operate through cut spiral gears, thus requiring no extra locking device. Each housing is independent of the other, and both spindles drop below the table.

Another valuable feature of this machine is the construction of the countershaft, on the base of which, cast in one piece, all the pulleys and belt shifters are mounted. This is new and distinctive of the Fay & Egan machine, and makes for the most rigid construction, as well as eliminating all assembling on arrival at destination. Adjustable independent idlers are provided to take up the slack in either belt, so maintaining the proper tension at all times. The column, a single cored casting, very heavy, and with broad floor support, is of such design that it is not in the operator's way, and supports the working parts with absolutely no vibration. The operator has perfect control of this machine at all times by means of the foot treadle at the front.

Further information concerning this machine may be had from the makers at 362-382 West Front St., Cincinnati, Ohio.

THE ALLEN HAMMER RIVETER.

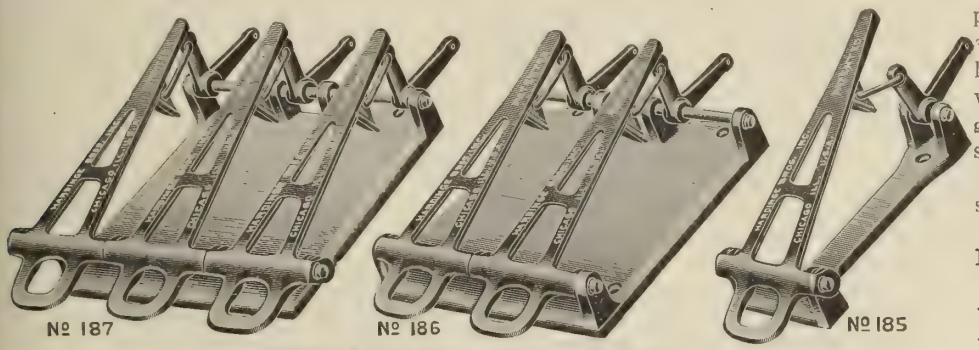
A notable addition to the line of hammer riveters, built by the John F. Allen Co., 370 Gerard Avenue, New York City, is shown in accompanying cut. This riveter, on account of its shorter reach and lighter weight, is intended for work beyond the scope of the regular Allen boiler riveting machines, and should have a wide application. Its reach is 15½ inches, and it is sufficiently powerful to drive rivets from ⅜ to 1 inch diameter.

In operation the work to be riveted is placed so as to bring the rivet head on die "D" with the free end of the rivet pointing toward the axis hammer cylinder "C." Upon moving handle "B" toward "C," air is admitted to cylinder "A." This closes arms "X" and "Y" and with a pressure of about 4,000 lbs., firmly secures the plates to be riveted, between die "F" and nozzle "N."

When button "G" is pressed, air is admitted to cylinder "C." This causes the hammer to strike the end of the rivet a series of swift blows, heading the rivet in a few seconds. Upon releasing the pressure upon button "G," the motion of the hammer is arrested. Moving handle "B" toward the rear of the riveter, at once opens arms "X" and "Y" and releases the plates, which are moved immediately upon inserting the rivet into position and the riveting operation repeated.

The machine is in balance when suspended from hook "S" and can be swung in any direction. It turns on its long axis "L-L" by means of the handle wheel "W," which operates a worm engaging a worm wheel enclosed in the supporting ring "R."

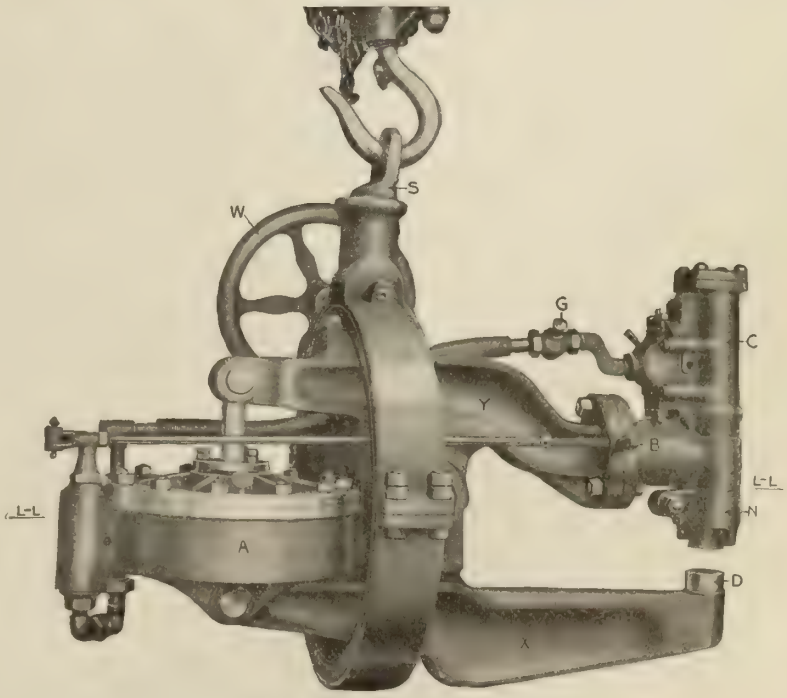
This riveter operates on air at a pressure of from 60 to 100 pounds.



Hardinge automatic locking foot treadle.

HARDINGE AUTOMATIC LOCKING FOOT TREADLE.

IT will be noted that when the foot is pressed down, as in Figs. 186 and 187, the upward pulling of the wire locks the



New Allen hammer riveter.

treadle, and by simply pressing on the heel part, the treadle is again released, making the operation just as easy as if there were no locking feature. The device seems attractive and useful for application to such machines as are started by foot; further, it enables the operator to manipulate the treadle at will, according to requirements.

Hardinge Bros., Lincoln Avenue, Chicago, are the manufacturers of this treadle.

Shop Kinks and Methods*

By William Hall.

THE matter of shop kinks and methods as applied to railroad shops and other manufacturing establishments is a factor to be counted on, when considering the efficiency, not only of our great and up-to-date shops, but of the small and isolated places, and more especially the latter, for in the larger shops it is less difficult to get the proper tools necessary for a job. Until everything mechanical has been improved to its utmost and universally adopted, there will be call for shop kinks, and individual effort in devising them.

Kinks Afford Scope for All.

Great inventors, like poets, are born, not made. We can't all be Edisons, any more than we can all be Byrons or Tennysons, but very happily it does not require a great inventor for most of our shop kinks, nor is it always the most intricate piece of mechanism, that is the most useful and counts most towards efficiency. More often the home or shop-made tools, the result of a few hours thought, the tools that can be made use of every day, are those to give us the best all-around results. These kinks or short cuts, if you please are designed for the purpose of reducing exertion on the operator's part, and decrease the time on and expedite certain operations. All kinks, however, are not applicable to every shop for what would be practical in one could not be used in another owing to local conditions.

Lack of Encouragement.

A great many more shop kinks would be designed and used were it not for the prejudice of some men in authority. This same prejudice has killed the ambition and aspirations of many a good man; probably I should have used the word selfishness—the terms, however, are synonymous. A man may be intensely earnest in endeavoring to produce something very practical and very efficient, but his efforts are not appreciated; he receives no encouragement, hence his work counts for nothing. I believe that the practice of devising shop kinks and methods should be fostered and encouraged to its fullest extent, for it will be to the best interest of all concerned. I also believe in giving every man his honest due. If a kink has been developed from a hint or suggestion from some workman, however humble a sphere he may be filling, let him get the credit, for possibly if he had the facilities at his command he could have brought out the kink himself. I believe that more kinks would be published, were it not for the fact that all af us are not draughtsmen, and, therefore, are unable to procure tracings or photographs to send to the editor of the shop kink section of our magazines.

Services Rendered by Kinks.

That great service is rendered by these various and numerous kinks is without question. There is great saving of energy on the part of the operator, and the efficiency of the shop is increased according to the merit of the kink designed and adopted. I have said that it is often the the simple little kink that counts for efficiency, and as an illustration will cite a small tool designed by the writer, for the purpose of testing crank pins. Sometimes in tramming an engine in the running sheds, we find the pins do not coincide with the main or wheel centres, indicating that one or more pins are either sprung or not quartered correctly, and in order to find this out, wheels must be removed and placed in a quartering machine to find out which pin or pins are out, requiring the services of from four to six men, but the simple kink designed by the writer eliminates this difficulty; pins can be tested without removing the wheels, and the device is so simple that it can be operated by any intelligent apprentice.

Another case I recall, where, being necessary to finish a set of shoes and wedges from the rough, the planer hand would finish each shoe and wedge separately in a chuck. By the introduction of a simple angle-iron, five shoes or five wedges were finished in one operation, the number being limited only by the length of the planer bed. This was on a single-headed planer.

I could cite numerous cases just as simple, and equally efficient, such as using arbors for planing cross-heads, instead of removing the piston for that purpose, and the introduction of frame spreaders made from piping, instead of using heavy jacks, thus not only increasing the efficiency of the men and the shop, but eliminating the element of danger of a heavy jack falling and hurting some one.

Kinks as an Aid to Shop Efficiency.

The gain in efficiency of a shop using kinks is difficult to estimate, as the gain depends upon the kinks themselves and local conditions, and may vary from 10 to 500 per cent.

It has been said, that "necessity is the mother of invention," and many of our shop kinks are the results of some hard thinking on the part of some man who was up against it. Others, again, have been the result of accident; in their case, results have come unsought.

*Abstract of Paper read at the General Foremens' Convention.

SAFER, QUICKER AND CHEAPER RAILROADS.

C. Reginald Enock, in introducing the subject of "Necessity for Safer, Quicker and Cheaper Railways," in a paper read before the Society of Engineers, London, England, argued that the capabilities of the ordinary steam railway do not keep pace with the requirements of the times; that there are too many accidents; that traveling is too slow; the cost of construction too heavy; that freight and passenger rates are too high; labor insufficiently paid, and dividends less than they should be. He pointed out that the mountainous regions of the globe are still undeveloped, due to heavy cost of railway construction. He showed that the heavy cost of English railways is largely due to land purchase. He considered that radical changes in design and construction are now called for, in the interests of safety, rapidity, and economy. He brought forward a proposal for a new type of safety telescopic buffer carriage, to minimise shock and loss of life in collision, and suggested a special lookout man on express engines.

He discussed the possibility of evolving a new type of railway altogether, and brought forward a plan for light overhead railways, with single motor or electric vehicles traveling at high speeds, with special provision against derailment, by additional horizontal wheels. If such a type were found practicable, the present great cost of railway construction would be lessened, as land for right of way would not be rendered useless for agricultural purposes, and embankments, cuttings, bridges, tunnels, drainage, ballast, sleepers, telegraph poles, and other matters would no longer be necessary. He urged that national experiments should be carried out on a specially equipped site, in order to give greater scope to inventors and to evolve improvements; and suggested that enquiry might be made into the possibility of a combination of railway and aeroplane.

He concluded by saying that both engineers and railway managers must come to the rescue of society with improved methods, and greater ingenuity and economy.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol VII. November, 1911 No. 11

THANKSGIVING DAY, 1911.

WE join with our readers in giving thanks to a bountiful Providence for not only providing industrial prosperity, with its labor and recompense to our steadily increasing population, but for averting that class strife and bitterness, which, with its disastrous consequences, has marred the fair records of other lands during the past year. The outlook is for a continuance of equally good times to that which we have been experiencing.

Much prosperity, we all know, is not conducive to increased contentment, because a propagator of selfishness. Unless, therefore, those who direct and those who serve temper it by the cultivation of tolerance and respect for each other in their shortcomings, Canada, too, will have her future Thanksgiving Days disfigured by strife and class bitterness. Needless to say, we hope for many happy returns of the day.

CANADA'S ACCIDENT RECORD.

INDUSTRY'S toll of death and serious injury is reaching to figures somewhat higher than most of us would care to give credence, did they not have the stamp of officialdom. In another part of this issue will be found the Department of Labor returns for the month of September. There were 58 fatalities and 122 serious injuries recorded. The question naturally arises: Is everything possible being done to prevent and minimize these occurrences? Is there contributory negligence on the part of both employer and employe? Is each taking the necessary precautions for their prevention, as they should? or are they leaving their best interests to that most unsatisfactory of recourses—legislation? Prevention is better than cure—yes, and the legislation cure is worse than the disease.

Much, we admit, is being done in the matter of installing safeguards on manufacturing equipment, but much more can be and should be done. The desire to keep down expenses and increase profits on the part of employers contributes, together with the bait of increased remuneration for the employe who takes the "last ditch," as it were, in his efforts, to more or less neglect of the duty that the former owes to the latter, and each to themselves and those dependent upon them.

Compensation for injuries, fatal or otherwise, is meet and right, although always unsatisfactory from every point of view in its ultimate determination. Protection is what both sides will find to be the best solution, and no man is a sufficient protector of himself or of those in his care, who neglects to keep alive the instinct of self preservation and usurps its place with a greed which seeks to extract the last cent that physical endurance permits. Efficiency, carried too far, will, we fear, cultivate concentration of effort in a narrow groove and kill observation and alertness over that wide range to which our natures aspire and for which they are fitted.

THE CARE OF EMERY WHEELS.

A FEW weeks ago, in a Toronto foundry, a man was killed by the bursting of an emery wheel, near which he was working. Such accidents are, fortunately, rare, though we are surprised that they do not occur more frequently, in view of the ignorance displayed in so many shops of the proper way to care for emery wheels. Take the above accident as an example. At the inquest, the jury found that the wheel had a flaw in it and was unfit for use. This may or may not have been the case, but it came out in evidence that when the wheel had glazed, the man in charge, instead of using an ordinary dresser, had hacked the face with a hammer and chisel. Such treatment would be sufficient to injure any wheel, and we should not be surprised to find that a crack was thus started which was the direct cause of the accident.

When visiting foundries and machine shops, we constantly see emery wheels fitted with side washers which are far too small to give adequate support. About a month ago, we saw a glaring case of this kind, and in conversation with the foreman, learned that a wheel on the same machine and running under similar conditions had burst about a year previously, on which occasion the said foreman was struck on the head by one of the flying fragments and seriously hurt. It is said that "a nod is as good as a wink to a blind man," and this gentle hint was as effective as either in this case, for on emerging from the hospital, he proceeded to equip the grinder with a new wheel—and used the same old washers again!

The manufacture of abrasive wheels has reached a high pitch of perfection, and as they are all tested to run at much above their working speed, it is seldom that one bursts, through an inherent defect, if purchased from a reliable maker. Nevertheless, every precaution should be taken to ensure their safe operation.

AN AWARDS SCHEME.

THE article appearing in another part of this issue sets forth the advantages accruing through the evolution of "kinks, methods or devices" from the brains of workmen in every field, department and station. More industrial development than many of us care to admit has been due to the mechanic and helper, yet little credit and reward of such humble genius has been apparent. We purpose, in an early issue, to tell our readers of the operation of an "Awards Scheme," whereby employes of every grade found profitable outlet for the display of intelligence in their daily work.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

MOLDING AN UNUSUAL BAFFLE PLATE.

By John H. Eastham, Montreal.

ALONG with contracts for ordinary work, most jobbing foundries receive every now and then, an order for a casting or a series of castings a little more complicated than usual. In this category, the baffle plate here described may safely be placed, and although of

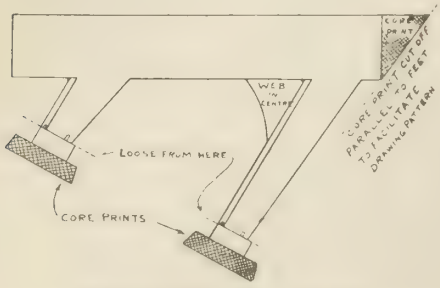


Fig. 1.—Baffle Plate Pattern.

no great size, it is well worth description.

Method of Molding.

Figs. 1 and 2 show side and end views of the pattern, which was placed feet upwards on an ordinary flat board, and the cheek or mid-part first rammed up. A parting was made at the face of the core prints, the loose pieces drawn out, feet cores placed in position and securely spiked. The drag was next rammed in the usual way, care being taken when venting, not to strike the cores or that part of the mold from which the loose pieces had been withdrawn. The job was then rolled over, the parting made, and the cope rammed up and removed.

Owing to the angle at which the feet were placed, great care was required in drawing the pattern, the print at the end being cut off parallel with the feet to facilitate the operation. The core at this end squares up the end of the casting as may be seen in Fig. 3, which shows the completed mold.

Emergency Parting.

The parting made below the feet was for emergency use, as in the event of loose sand falling down the mold, the shape of the latter would have made thorough cleaning out impossible, except by the removal of the cheek and cores.

The straight irons bedded in the overhanging corners at A, A, A, A, prevented the sand from pulling up during withdrawal of the pattern, and also washing and scabbing when the mold was poured.

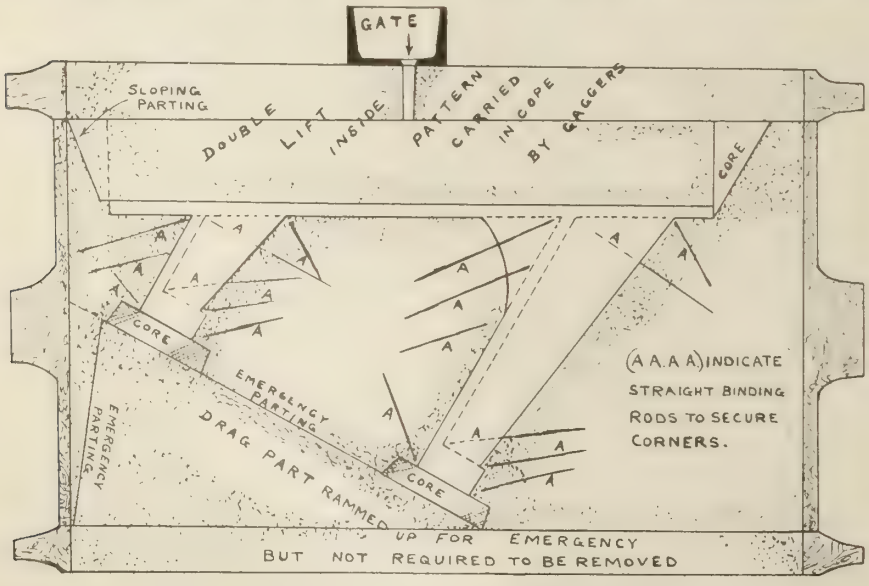


Fig. 3.—Baffle Plate—Completed Mold.

DISK GRINDING SECRETS.

"There is no secret or mystery in modern disk grinding or disk grinding processes. If your competitor is at all alive, he knows—or can if he wants to—whether or not you operate a disk grinder.

Time was, however, when the first disk grinders were installed that their owners did not want anyone else to know there was such a tool on the market. They guarded their disk grinder with envious eyes for fear their competitors might learn of this labor-saving tool.

But that time has passed. Trade papers, advertising, salesmen and all bearers of new 'thinks' make it impossible to keep the disk grinder hidden. It is needless to say we are doing our best to make it public property.

This leads us to the question, 'Is it worth while to try to keep secret your methods of machining?' This has been tried—and is being tried to-day—by many manufacturers, but generally with little success. As long as your method requires you to employ help your secret is bound to leak out. Your employes are apt to leave you, either in good or bad graces, and with them goes your secret.

Of course, this matter is the manufacturer's own business, but it has been demonstrated beyond doubt that those

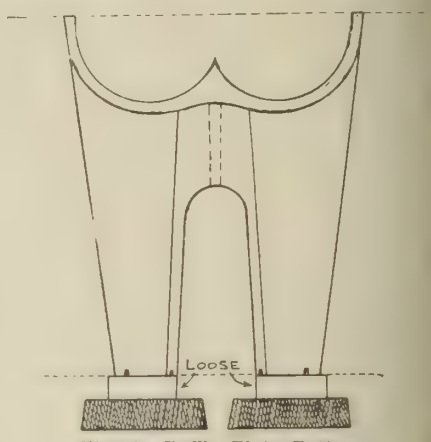


Fig. 2.—Baffle Plate Pattern.

who invite visitors into their plant and show them how they do things are just as prosperous as those who do not. This latter type may be likened to an ostrich which buries only his head in the sand and thinks he is entirely under cover. If you have tools, methods and devices upon the exclusive use of which your success depends it would be far more satisfactory to have them patented."—The Gardner Grinder.

GREEN SAND, DRY SAND. LOAM and CORES

By Joseph Horner.

IF this subject is considered on broad lines, there is no question as to the extent of field covered by the various sand preparations. There are, however, considerable differences of opinion held by individuals, as to the relative utility of each in special cases. As in so many other matters, the border lines which define the sphere embraced, are not of a sharp and definite character, therefore, much overlapping occurs. One foreman will use cores extensively in a class of work which another will treat in green sand. One will prefer dry sand, another will employ green, and a third will use dry sand instead of loam. Sometimes it is a question of relative expense, but more often it is one of general soundness of the castings pro-

duced, their neatness of finish, or the lessening of the risk of wasters. In some cases, choice is determined by local conditions, such as capacity of drying stoves, tackle available, and so on. The broad outlines of the separate spheres being more or less well defined, these with modifying conditions will now be considered.

Green Sand.

This occupies by far the largest place in foundry work, the reason being fairly obvious. In the first place, it serves excellently for perhaps quite eight-tenths of the total work done, and is easily manipulated. It affords a cheap method of working, because when a mold is made, no further drying is necessary except in some few cases, and then only a mere skin drying. It is convenient, because a large range of mixtures is obtainable, ranging between weak and strong for lighter and heavier work, and for different sections of the same mold, subject to less or greater pressure. Green sand mixtures have features in common, as follows:—They are loose and are rammed green or moist; they are not dried, the molds being poured into, without change of condition from that in which they were rammed.

Suitability of Mixtures.

The suitability of mixtures, each for its own special line of work, depends on three main conditions. These are the character of the mixture, as determined by the proportions of the open, loose and free, or close and clayey character of its constituents, without reference to these qualities being a result of chemical differences; by the amount of water present, and finally by the manner and degree in which the ramming and venting are done. Only a molder perhaps fully understands in how large a degree the soundness and smoothness of the skin of a casting are dependent on these two conditions. Too loose ramming entails lumps, too hard ramming, scabs. Insufficient venting in almost any case results in blows and sponginess, and the harder a part is rammed, the more freely should venting be done. The few exceptions to the need for venting only occur in small molds made of very open sands.

Green sand mixtures are rammed chiefly when enclosed in boxes. The box filling is old sand which has been used over and over again, having been turned out of the boxes after casting, and rewatered and mixed for repeated service. New sand, a facing sand mixture, is rammed directly against the pattern, and the old or floor sand is used for filling up, hence termed "box filling." The facing sand only occupies from about 1 to 2 or 3 inches thickness, and increases with the dimensions of the mold It contains ground coal dust or charcoal to prevent sand burning. The carbon ignites and burns away, leaving the sand honeycombed and porous, while the gas generated forms a film interposed between the molten metal and the sand

Reasons for Non-Universal Adoption.

The reasons why the utilities of green sand molds are not of universal application may now be noted. First, the sand, though rammed, is too loose and weak for some molds in which numerous sections stand out in cantilever fashion, and are thus liable to become broken off and washed away by a heavy flow or rush of metal. Much assistance can be afforded such sections by rods and nails, but their use is often too limited to be reliable. The larger the mass of intricate molds the greater are these risks, and although a strong mixture of sand be used in such molds, the body of which would be rammed with ordinary sand, the risks of wasters are too great to be taken. This being the case, green sands are wholly discarded for another material.

Another thing, entailing some risk in green sand work, is the presence of a large number of cores. The risk is cumulative, the numerous cores and vents being liable to cause trouble in addition to the mold proper, due to the large aggregate amount of gas generated in pouring. Intricate steam cylinders of large dimensions are cases in point. Again, where the risks of actual wasters may be slight, there are others, such as lumpiness of surface, general or local sponginess, roughness of skin, and slight scabbing of castings, which founders of repute do not like to send out, and which many inspectors would condemn. In face of such risks it is better to abandon green sand and employ a rather more expensive way of molding

Dry Sand.

This is a strong sand mixture containing horse manure. When dried, it is hard in mass, though rather fragile in weak sections. It offers a firm surface against the pressure of metal, and little gas is developed at casting, because the moisture of the water used in mixing, is dried out in the stove before the metal is poured. It is, therefore, a safe mold, though more costly than green sand, due to the necessity for drying it.

The differences to be noted in the working of dry sand, besides that of drying, are of three kinds. First, the ramming must be harder, as hard as can be done. Second, the venting is supplemented and helped by the burning out of the particles of hay in the horse manure during the drying of the mold. Third, the joints must be finned, i.e., pressed down with the trowel after delivery of the pattern, and before drying, for unless this be done, the joints will be crushed and will fracture on closing the mold Such a contingency does not occur in green sand, because it yields slightly, but dry sand is too hard and rigid to yield. Finning the joints has the effect of throwing the sand adjacent to the edges out of actual contact, and a very slight fin results in the casting, but this is of no consequence.

Loam Work.

This occupies a sphere which is narrowly defined. With very slight exceptions it is retained for work mainly cylindrical or circular which is too large to be made from a pattern on account of the cost of the latter. There are of course, fittings more or less numerous, not circular, such as feet, flanges, steam chests, and the like, and for which pattern parts have to be made. The main cylindrical or circular sections are swept up with boards, against loam plastered on and sustained by brickwork. Loam is daubed and built against the fittings which are also supported by brickwork built to their outlines with the necessary loam clearances.

Loam is also used for sweeping-up large cores around a vertical axis against brickwork, also for cores on a horizontal axis, laid around a central core bar, with hay or straw ropes to bind the loam together, and to make up thicknesses. Often the thickness has to be made up in some section with plates threaded on a central bar, and having the interspaces filled with haybands and loam. Again, loam is used for sweeping-up patterns to be molded in green or dry sand. This is done when work is too long and too small in diameter to be swept-up on a vertical axis. Loam patterns may be plain, but much more often they carry fittings of wood, just as though the main body were of wood instead of loam.

Loam is of one mixture, but is ground and sieved coarser or finer according to the location in which it is to be used. Coarse loam is employed for roughing, finely sieved loam for finishing coats. All loam contains quantities of horse manure. A strong sand is used mixed with water, and dried thoroughly in a stove. Usually it is self-venting, but awkward corners and angles are vented with the wire.

The Problems Involved in Machine Tool Standardization*

By L. P. Alford

The writer shows in this paper that as well as standardization of product being of immense advantage in manufacturing, equally beneficial results are achievable from a standardization of processes and tools by users.

STANDARDIZATION of product is a necessity in manufacturing. It is the starting point in every attempt to produce great quantities of parts cheaply and uniformly. The advantages are readily recognized. There are similar advantages in the standardization of processes and tools used in manufacturing, and this broad fact is the reason for this paper. The problem of standardizing machine tools is very important. I propose treating it so as to establish the principles which should be followed to obtain the desired uniformity in details, rather than go very far into the details themselves, except by way of illustration.

Nomenclature of Machine Tools and Parts.

Before beginning my argument with reference to mechanical details I must refer briefly to the nomenclature of machine tools and their parts. You have a committee which is considering the question of standardizing the names of machine tools. Permit me to say that I am in full sympathy with this movement and hope for a speedy report and action by your body. But is there not a wider field, that your committee might consider, than merely the generic names of machines? Why not take up the names of individual parts? No argument is needed to convince you of the confusion that now exists. Take the common word dog. There are probably as many varieties of inanimate dogs as there are species of canines on the benches of the average dog show.

What is the distinction between a table and a platen, between an arbor and a mandrel, between a bed and a base, between a pillar, a post and a column? What is a jig, a fixture, and so on? Lest you think I am wandering from my subject, I hasten to point out the connection. The foreign user must not be forgotten. Whatever simplifies the descriptions of machines, facilitates translation and comparison, and is a direct aid to him in getting a mastery of the situation. In the interest of technical accuracy, it is very much to be desired that a reasonable uniformity should be established in the names of machine parts.

*Read at the New York meeting of the National Machine Tool Builders' Association.

DIMENSIONS OF TEN 20-INCH 10-FOOT BED ENGINE LATHES

SWING.			SPINDLE DETAILS							
Swing over bed.	Swing over carriage	Swing between centers 10-foot bed	Spindle nose....	Taper of hole...	Centers	Hole in spindle.	Lead screw.....	Weight, pounds.	Belt speed.....	Size of tool, inches .....
	12¾	6'	3¼ x 4	Morse 5	M 4	1½		3,800	375-500	⅝ x 1¼
20¼	12¼	6'2"	3 x 6		M 4	1¼		4,000	660-843	
22½	14½	6'1"				1 9-16	4		445	
20½	12½	5'4"			1 25-32	1¼		4,600	880	
22⅛	13½	5'	3½ x 5		Morse	1½	4	4,200	660-825	¾ x 1½
21¼	13¼	5'5"	2¾ x 5		Morse	1 13-16		4,390	807	
20⅛	13¼	5'6"	2¾ x 5			1¼		3,300	600	⅝ x 1¼
22	14⅛	5'9"			M 4	1½		4,200	330	
21¼	12¾	6'	2¾ x 6			1 11-16		3,800	347-460	⅝ x 1¼
20⅛	11¾	6'1"	3 x 6			1⅝		3,260		

Important Principles in Standardization

Turning to the machines, there are six important principles in standardization, which I have formulated, as follows:

1.—Standardize corresponding designations and capacities, and establish a method of power rating.

2.—Standardize devices for holding cutting tools.

3.—Standardize devices for holding work and fixtures.

4.—Standardize operating movements.

5.—Standardize parts concerned in the setting-up of machines, with reference to the permanent shop equipment.

6.—Accept the geometric progression as a fundamental requisite in designing feeds and speeds.

The application of none of these principles will introduce a radical change in design, for, on the contrary, either through action by this association or through a process of natural development, uniform features can be pointed out substantiating the importance and setting a precedent for the application of each principle.

The First Principle.

The first principle aims at a standardization of corresponding machine designations and capacities, and the establishing of a method of power rating. In 1903, action was taken by a number of milling machine manufacturers, establishing the maximum feed travels for various sizes of knee-and-column milling machines. For example, the maximum

DIMENSIONS OF SIX NO. 2 MILLING MACHINES

SPINDLE DETAILS				TABLE DETAILS					COLUMN DETAILS						
Thread on nose..	Taper hole in.... spindle	Width of slot in end of spindle, inches	Distance column face to spindle end inches....	Thread of draw-in bolt.....	Working surface of table, inches	Number of T-slots.....	Size of T-slots, inches	Spacing center to center of T-slots, inches...	Telescoping screw	Width of face of column, inches	Angle of V on column, degrees	Distance column angle goes above spindle center, inches..	Over arm diameter, inches....	Outboard bearing diameter, inches	Circ. speeds of pulleys, r.p.m.	Weight .....
2½ inches diam., 4 thds. per in., L. H., U. S. S.	10	none	1⅜	None, bolt not furnished.	39¼ x 10¼	3	⅝	2½	yes	9⅛	50	5½	3½	1 13-16	450 505	2,850
2 inches diam., 8 thds., U. S. S.	10	none	3¼	⅝ inch, 11 thds.	43¾" long, 10" wide	3	⅝	2 5-16	yes	10	45	2¾	4¼	2⅜	510 650	3,050
2½ inches diam., U. S. S., 4 per in., L. H.	10	none	3	⅝ inch, 11, U. S. S.	39 x 10½	3	⅝	3	yes	9¾	50	3½ below	3¾	1⅝ 1⅞	420 470	2,600
Five per inch •	10	1 5-16	3⅞	12 thds. per inch.	11¼ x 47¼ length over all 52	3	⅝	2½	yes	10⅛	45	2½	3¾	11-16	580 785	2,460
2¼ inches x 12	10	none	1⅜	⅝ inch, No. 11.	41 x 10	3	⅝	2¼	yes	9½	40	about even	4	11-16	590 730	2,850
2¼ inches diam., 1¼ lead, ¼ pitch, U. S. S.		1 35-64	3¼	⅝ inch, 11 thds.	47¼ long, 11 wide	3	⅝	2 5-16	yes	10⅝	45	2⅝	4¼	1 13-16 2⅜		

feed travels for a No. 2 Universal machine were fixed as follows: Longitudinal, 25 inches; cross, 8 inches; vertical, 18 inches. This was a start toward standardizing designations and capacities. The resulting uniformity is of advantage to the buyer in comparing the various makes of machines designated as Nos. 1, 2, 3, 4, etc. But this is only a beginning.

To develop the point, let me ask what is a 14-inch, 6-foot bed engine lathe? To answer my own question, I don't know. From data that has been gotten out, comparing some of the dimensions of a number of 14-inch, 6-foot bed engine lathes, it is found that the diametrical swing over the bed ranges from 14⅛ to 16⅛ inches; the swing over the plain carriage from 7½ to 10¾ inches, and the maximum distance between centres from one foot six inches to three feet three inches.

From the user's standpoint, it is as important to know the diameter that can be swung and turned over the carriage as it is to know the maximum diameter that can be swung over the ways, and the length of the bed is of no more interest than the height of the lathe hand who operates it. A similar argument can be presented for other kinds of machines, but would only serve to unnecessarily lengthen this discussion. Is there not an opportunity to bring about reasonable uniformity of corresponding designation and capacity, making these descriptive?

Question of Power Rating.

Turning to the question of power rating, the user should have some means of distinguishing between the relative capacity for removing metal and mechanical efficiency of machines of the same dimensional capacity. If he asks for bids on a 20inch 10-foot engine lathe, and in one case is quoted $600 and in another $450, he should have some means of knowing that the difference in price represents a difference in metal-removing capacity of the tool. Let me call attention to the phraseology that I have used in connection with this point:—To establish a method of rating rather than standardize ratings themselves. Development is giving us light-powered and heavy-powered machines; each kind has its field, but there should be some way to differentiate them except by name.

Dimensions of Ten 14-Inch Lathes

Swing: Swing over bed.	Swing: Swing over carriage.	Swing: Swing between centers.	Spindle Details: Spindle nose	Spindle Details: Taper of hole.	Spindle Details: Centers.	Spindle Details: Hole in spindle.	Weight, 6 ft. bed, pounds.	Lead screw.	Belt speed.	Size of tool, inches.
	8½		2¼ x 6	Morse 4	M 2	1	1,715	6	285-362	½ x 1
14⅛	8⅜		2⅛ x 6		M 3	1¼		4	645-785	½ x 1
15¼	9½	3 3				1⅞		8	950	
16	10½	3	2¼ x 8			1⅛	1,600	5	475	½ x 1
15¼	10¾		1⅞ x 8			¾		6	375	
15¼	9⅝	3 4	2⅛ x 5		M 3	1⅞	1,650		350-475	⅝ x 1
14¼	7½	2 11	2¼ x 7			1⅛	1,550		585	
15¼	8½	2 6	2⅜ x 7		M 3	1¼	1,825		380-485	½ x 1
14⅜	8⅜	3 1	2 x 7	⅝ per ft.	M 2	1 3/64	1,600	6	375	½ x 1
16⅝		3	2⅞ x 6	⅝ per ft.	M 3	1⅛	1,850	6	525-660	⅝ x 1

The Second Principle.

The second principle refers to standardization of devices for holding cutting tools. The small tool equipment of a shop represents a large investment. The more adaptable this equipment is, the fewer pieces there need to be in use; and the greater the number of hours each small tool can be at work, the greater the operating efficiency of the shop. The interchangeability of lathe tools and tool holders throughout the tool posts of all lathes of a given size, the interchangeability of milling cutters and their collets among machines of different makes, the interchangeability of drill chucks throughout all the drilling machines of a given department, and so on, represents a real increase in efficiency which is so apparent as merely to need mention to be recognized. To show that this principle has already influenced design, I have but to refer to the taper of the hole in the spindles of milling machines. For the No. 2 milling machines, whose dimensions are tabulated, all had the hole in the spindle conforming to Brown & Sharpe's No. 10 taper. Similarly, for the No. 3 milling machines, the spindle taper was found to be uniformly Brown & Sharpe's No. 11. Again, the Morse taper is extensively used in drilling machine spindles, and in the ten 14-inch engine lathes investigated, the majority of the tools' post slots were found to be made for ½ x 1¼ inch tools.

The Third Principle.

The third principle proposes to standardize devices for holding work and fixtures. The arguments presented in favor of standardizing the devices for holding cutting tools apply here with even greater force, for the devices and fixtures for holding work are more expensive as individuals than are separate cutting tools. Consider the advantages of having chucks interchangeable through out all of the lathes of a given size in a lathe department, or consider the advantage of uniform T-slots throughout all kinds of machine tools of relative

Dimensions of Six No. 3 Milling Machines

Spindle details: Thread on nose.	Taper hole in spindle.	Width of slot in end of spindle, inches.	Distance column face to spindle end, inches.	Thread on drawing bolt.	Working surface of table, inches.	Number of T-slots.	Size of T-slots, inch.	Spacing center to center of T-slots, inches.	Telescopic screw.	Column Details: Outboard bearing, diam., inches.	Width of face of column, inches.	Angle of V on column, degrees.	Distance column angle goes above spindle centers, inches.	Over arm diameter, inches.	Circumferential speed of pulleys, r. p. m.	Weight, pounds.
3¼ inches diam., 3½ threads per inch L. H, U. S. S.....	11	1½	1⅜	none, bolt not furnished	53 x 12¼	3	⅝	3	yes	2⅛	11½	50	6¼	4¼	760 600	4,350
2½ inches diameter, 6 threads, U. S. S....	11	none	3	⅝-11 threads	52 long 12 wide	3	⅝	2⅜	yes	2⅛	10⅞	45	2⅛	4½	765 1,225	4,350
3¼ inches diam., U. S. S., 4 per inch., L. H	12	1½	3⅛	¾-10 U. S. S	48½ x 13	3	⅝	3½	yes	1⅞ 2⅛	12	50	4 below	4½	1,640 1,640	6,700
Five per inch.....	11	1⅜	3¾	12 threads per inch	13½ x 58¼ 63 over all	3	⅝	2½	yes	1⅛	12	45	4½	4¼	660 800	4,200
2⅝ inches x 12.....	11	none	1½	⅝-No. 11	49 x 12	3	⅝	3½	yes	1⅛ 1⅜	10½	40	6½	4½	715 1,080	4,200
3¼ inches diameter, 1⅓ lead, ⅓ pitch. U. S. S.....		1 35/64	3¼	⅝-11 threads	55¼ long 13½ wide	3	⅝	2⅜	yes	2⅛	11¼	45	2¼	4½		

similar sizes. A milling fixture can then be used on any milling machine of a given number, holding-down bolts can be standardized as regards the sizes of heads, with the full assurance that they can be used on a milling machine, or drilling machine, or planing machine, or lathe, as the case may be. In addition to the enormous saving in original investment and increased flexibility of the equipment, there is an attendant saving in the time required on the part of the workmen to find devices that can be used.

The Fourth Principle.

To show that something has been done in recognition of this principle, I have but to refer to the table slots of milling machines. Of the milling machines investigated, the table slots were uniformly $\frac{5}{8}$ inch. The fourth principle refers to the standardization of operating movements. Rapid repetition work depends very largely upon the sense of touch of the operator. Frequently repeated movements become, to a great degree, involuntary. It, therefore, follows that a standardization of the operating movements of machine tools will contribute to an operator's speed by making his motions, to an extent, involuntary and permitting him to change from one make of machine to another without any disturbance to the habits that he has formed. On all standard lathes, the same direction of motion of the foot-stock handle should advance the spindle toward the head. Similarly, a definite direction of motion of the hand wheel on the carriage should advance the carriage toward the head, and so on, for the other hand-operated movements.

To show that this principle has been recognized in the engine lathes investigated, the direction of motion of the operating handles was uniform to produce a correspondong movement of the operating parts.

The Fifth Principle.

The fifth principle sets forth the standardization of parts concerned with the setting-up of machines with reference to permanent shop equipment. There are only a few points to be considered here, such as the spread of the bolt holes in the feet of the countershaft hangers, the drop of the shipper rod, and for motor-driven tools, the dimensions of the motor feed pads. I understand that a committee of your association has consulted with a committee of electrical machinery manufacturers in regard to this latter feature, but that thus far, a working basis has not been reached. I need not dwell upon the advantage to the user in being able to buy a machine that meets his needs from a machine tool builder, and a motor adapted to the machine from an electrical machinery manufacturer, which he can assemble himself with every knowledge that they will fit.

The Sixth Principle.

The sixth principle refers to an acceptation of the geometric progression as a fundamental requisite in determining relations throughout the chosen ranges for feeds and speeds. I have reason to believe that this principle is very generally recognized among you, especially among those producing milling machines, but there seems to be a wide difference in the ratios aimed at. Personally, I am not in a position to make any definite recommendation along these lines, other than to state the general principle.

To make my argument complete, it is evidently necessary to prove that a lack of uniformity exists in connection with the features covered by the principles outlined above, and at the same time that these differences are of such a nature as to indicate that uniformity can be established. To meet this requirement one of my associates has prepared four tables that form an appendix to this paper. Two refer to lathes and two to milling machines, and give, respectively, an analysis of many of the features capable of being standardized for 14-inch and 20-inch lathes, No. 2 and No. 3 milling machines.

The following lists of features to be considered for standardization are for the four fundamental machines, lathes, planers, drilling machines and milling machines. This does not imply that standardization cannot be carried on in connection with some other machines, but the limit of time prevented a consideration of them. However, the principles laid down are of such a nature that they can and should be applied to all classes of machine tools that are of a fixed type and made by a number of builders. The real work of determining dimensions is a long, tedious task, and cannot be done in a weak-kneed, faltering manner. Personal experience in the work of standardization has taught me that the difficulties in the way are always magnified. The way is easily found if there is a will to do. What follows is suggestive only.

Engine Lathe Standardization.

Designations and capacities might be linked together by giving three dimensions: First, the swing over the ways; second, the swing over the plain carriage; third, the maximum distance between centres. Thus, a 14-inch 6-foot bed engine lathe would become, say, a 14x8-inch x 3-foot engine lathe. The maximum swing over the ways should be fixed for each nominal swing; the other dimensions to be exact. As a suggestion merely, is it necessary to have so many nominal sizes of lathes as are now built and listed? As now arranged, these sizes roughly form an arithmetical progression, having a common difference of two inches. Has anyone considered arranging these sizes in a geometric progression with the direct purpose of reducing their number? If anyone is interested in this speculation let him start a progression with ten inches and apply the ratio 1.2.

A standard method of power rating might be to give the horsepower of the driving belt for the machine; this power to be figured by means of a determined formula with determined factors for single, double and triple belts. This same rating could apply whether the machine was belt-driven or motor-driven; for a given type and size of machine is usually built for both methods of applying power. This will permit a careful designer to develop a design and have a proper relation between power and rigidity. It will also permit the user to compare mechanical efficiencies.

For each nominal size of lathe the following details of designs should be standardized: The diameter, thread, and length of spindle nose; taper of hole in spindle; diameter of hole through spindle; taper of the centres; hole, keyway, face, pitch and kind of teeth of change gears for the ordinary screw-cutting type; number of threads per inch of the lead screw; size of T-slots in wings of carriage, direction of motion of operating handles, controlling movements of foot-stock spindle, carriage, tool block and compound rest.

Vertical Drilling Machine Standardization Features.

Features of vertical drilling machines that should be standardized for each nominal size are: Dimensions of table and finished surface of base; distance from centre of spindle to face of column; method of power rating; dimensions of the spindle nose, taper of the hole in the spindle; number, arrangement and size of T-slots in table and base, maximum distance from spindle to table and from spindle to base; direction of motion of operating handles.

Planer Standardization Features.

The features to be standardized in connection with planers are: A method of rating; method of stating capacity; number and size of T-slots in the platen, and dimensions of reamed holes in platen and direction of motion of operating handles.

Milling Machine Standardization Features.

In the planing machine, drilling machine, shaping machine and lathe, we have a precedent for a form of designation that of itself indicates capacity. Is there any good reason why milling machines should not be styled in similar manner? To illustrate, is not the designation a 25 x8x18-inch universal milling machine better from the viewpoint of conveying information, than to say a No. 2 universal milling machine?

Features to be standardized in connection with milling machines are: Designation and capacity; a method of rating; a length and width of working face of table; maximum distance from centre of spindle to table; thread on nose of spindle; diameter of nose; taper of hole; width of slot in clutch end; diameter of clutch end and distance from face of column to end of spindle nose; and taper of hole of spindle of vertical attachment and index head; diameter of over-arm; distance from centre of arm to centre of spindle; diameter of bore for outer arbor bearings; width of face of pillar and solid angle of edges; distance face extends above spindle centre; number, size and spacing of table slots; diameter and thread on draw-in bolt; general position and direction of motion of operating handles.

Inter-size and Inter-class Standardization.

Thus far my argument has been directed toward standardization within the general limits of a given size of a given kind of machine. We must also consider the advantages of inter-class standardization. Although this discussion cannot be carried very far until detail dimensions have been tentatively determined upon for the various sizes of the various classes.

The establishing of a standard method of power rating has been touched upon. It is evident that such a method would apply to all sizes and all classes of machines. Turning to details of design, a $\frac{5}{8}$-inch T-slot should have the same dimensions whether it is in a milling machine table, a drilling machine base, a planing machine platen, the wings of an engine lathe carriage, or the table of a shaping machine. If there is an advantage in being able to exchange chucks throughout the individual machines of a lathe department, is there not an added advantage if these same chucks can be used on certain sizes of milling machines? To put it a little more concretely, why should not the spindle noses of 16-inch engine lathes and No. 2 milling machines be identical, and again why should not the noses of No. 3 milling machines and 20-inch engine lathes be the same?

Motion of Operating Handles.

Turning to our fourth principle of standardization, should not the general position and direction of motion of the operating handles of a 14-inch lathe correspond with those of a 20-inch lathe? Should there not be similar uniformity between a No. 2 milling machine and a No. 3 milling machine, and so on?

General.

Referring to our fifth principle of standardization, should not the space of the holes in the feet of countershaft hangers for the countershafts of approximately the same weight and subjected to the same stresses, be uniform without reference to the machines they are used with? The advantage of such standardization in aiding the locating, spacing, and setting-up of countershaft stringers is apparent. Again should not the pads for the feed of a three-horsepower motor to be applied to a lathe be identical with those for a similar three-horsepower motor to be used on a milling machine?

As another general point, no screw or other part should be tolerated whose travel is of such a length that a hole must be cut in the floor to accommodate it. Machine users cannot countenance the cutting of holes in shop floors, particularly in buildings where the materials of construction are fire resisting.

It may seem to you that I have mentioned many points where uniformity already exists. If such is the case, the work of standardization is made all the easier, for all that is necessary is for your association to adopt them formally as your standard.

Proposed Standardization Well Received

Finally, I wish I could make you feel the enthusiasm with which this matter has been received by ALL the machine users with whom I have discussed it. From the viewpoints taken, it has been evident that the advantages of such uniformity will be felt not only in large manufacturing departments of machine shops, but likewise in the tool-making room and in the job shop. Its advantages in all three of these places have been emphasized to me. One superintendent said in substance, the tool room is the place where the greatest good from such uniformity will be felt, for there the work is special, there we feel the need of interchanging tools between machine and machine, and the equipment will be made truly elastic if details are standardized. A works manager said: "Our large manufacturing departments are the ones that will be benefited by the establishing of such uniformity," and the proprietor of a jobbing shop added: "Such standardization will save me money every day, besides permitting me to buy new machines of makes that I favor, but have not deemed it right to purchase in the past, because in many of the essentials they differed from the equipment already in use? Had I bought these machines, I would have had also to buy a special tool equipment to go with them." One enthusiast expressed himself by "me for it," while another man who had influenced the buying of $750,000 worth of machine tools during the past eight years, said: "Standardization of machine tools, as you have outlined it, is the greatest constructive step in machine-tool design that I can imagine."

15-16 INCH HIGH SPEED DRILL TEST.

We are in receipt of the following particulars of the test of a 15-16 inch high speed drill, through the courtesy of Alexander Gibb, 13 St. John Street, Montreal, Canadian representative of the drill makers, J. Beardshaw & Sons, Sheffield, England. The test was made on 25th August of this year, by the Sheffield Testing Works, Ltd., Blank St., Sheffield, England.

The drill, 15-16 inch diameter, is known as the "Conqueror" high speed, and showed an analysis in the steel bar of .44 carbon, .15 silicon, .34 sulphur, .031 phosphorus and .77 manganese. The revolutions per minute were 435, and the number of holes drilled 100. The depth of hole was 2 inches and, therefore, the total depth of hole cut was equal to 200 inches. The duration of test was 30 minutes, 46 seconds, the depth of hole per minute $6\frac{1}{2}$ inches, and the feed per revolution .015. The lubricant used was soapy water.

On conclusion of the test, the cutting edge of the drill was classed as being in good condition.

INDUSTRY'S TOLL OF DEATH.

Industrial accidents to 180 individual workpeople in Canada during the month of September, 1911, were reported to the Department of Labor. Of these 58 were fatal and 122 resulted in serious injuries. In addition, five fatal accidents were reported as having taken place prior to the beginning of the month, information not having been received by the department before September, 1911.

A Unique Census Counting and Tabulating Machine

By J. H. Williams*

A general description of an interesting and ingenious machine employed by the Canadian Government in compiling the recent Dominion census. It automatically tabulates all kinds of statistical information, and is the first of its kind ever built.

FOR tabulating the statistics obtained at the fifth Canadian census taken in June this year, the Dominion Government used the ingenious machine here described and illustrated. After a somewhat similar tabulator had proved its efficiency in handling the results of the last United States census, the designs for this present type machine were purchased by the Canadian Government from Chas. W. Spicer, the engineer, and tenders to supply three of them were thereafter invited. A high official from the Census Bureau at Ottawa, accompanied by Mr. Spicer, visited a number of machine shops in different Canadian cities to examine into their facilities for executing an order of this description. As a result of these visits, the contract was finally awarded to Jos. P. Cleal, mechanical expert, Toronto. Mr. Cleal is a well-known designer of cash registers and other intricate mechanisms, consequently his shop is well equipped for expeditiously turning out fine and accurate work.

The Census Cards.

The statistics are printed in contracted form on census cards, one of which is shown in Fig. 1. Each line of information is distant ¼ inch both horizontally and vertically from the next line. The cards, 6⅝ by 3¼ inches, have a uniform thickness of .006 inch. The reason for the right hand lower corner being cut off is to ensure their being all stacked right side up before being placed on the machine.

The cards are first perforated in a machine having a key board similar to a type-writer. One clerk reads out the information from the census papers sent in by the enumerators, while a second clerk punches the card to correspond. The card and the census paper are then turned over to two other clerks, one of whom reads out the information given on the card, while the other checks it by the paper; thus each card is checked twice. By means of the perforations in the cards, the tabulator is able to list the returns; the principle being analogous to that used in mechanical piano-players and similar instruments.

Operation of the Machine.

Fig. 2 gives a general side view of the machine, while Fig. 3 shows the front, where the card selecting is done. The small motor seen near the floor in Fig. 2, operates the machine, the cards passing through at the rate of 200 per minute. Referring to Fig. 3, the bar A, is electrically insulated from the frame of the machine, and as may be clearly seen in the cut, is notched to carry a number of brass fingers, six of which are seen in place. Each of these has a small pin running transversely through it near the front rounded shoulder, and each pin carries three fine springs of piano-wire twisted round itself, to make contact with the revolving cylinder below. The cards, after being perforated, are piled up on the platen or table B. They are compelled to pass into the machine square and true by suitable guides, which were removed for the purposes of these photographs. The rocker C, feeds the cards in at the rate of 200 per minute, a gate (not shown) preventing more than one card entering at a time. The cam, D, raises and lowers the vertical rod E, attached to which are a series of light metal chutes F. It will of course be understood that the cams, vertical rods and chutes are in pairs, one set on each side of the machine. The width of the chutes is slightly greater than the thickness of the card, and attached to each pair, there are two parallel wires about 6 inches apart, which terminate at one or other of the metal uprights seen in Fig. 2. These uprights form compartments into which the cards fall, after being conveyed along the wires by the fingers attached to the endless tapes seen in Fig. 3.

It must not be supposed that one passage through the machine suffices to tabulate all the information contained on each card. On the contrary, the card is passed through fourteen times, a different line of information being collected each time. When the cam D, is at the top of its stroke the edge of the card is always ¼ inch beyond the contact springs and exactly opposite the bottom

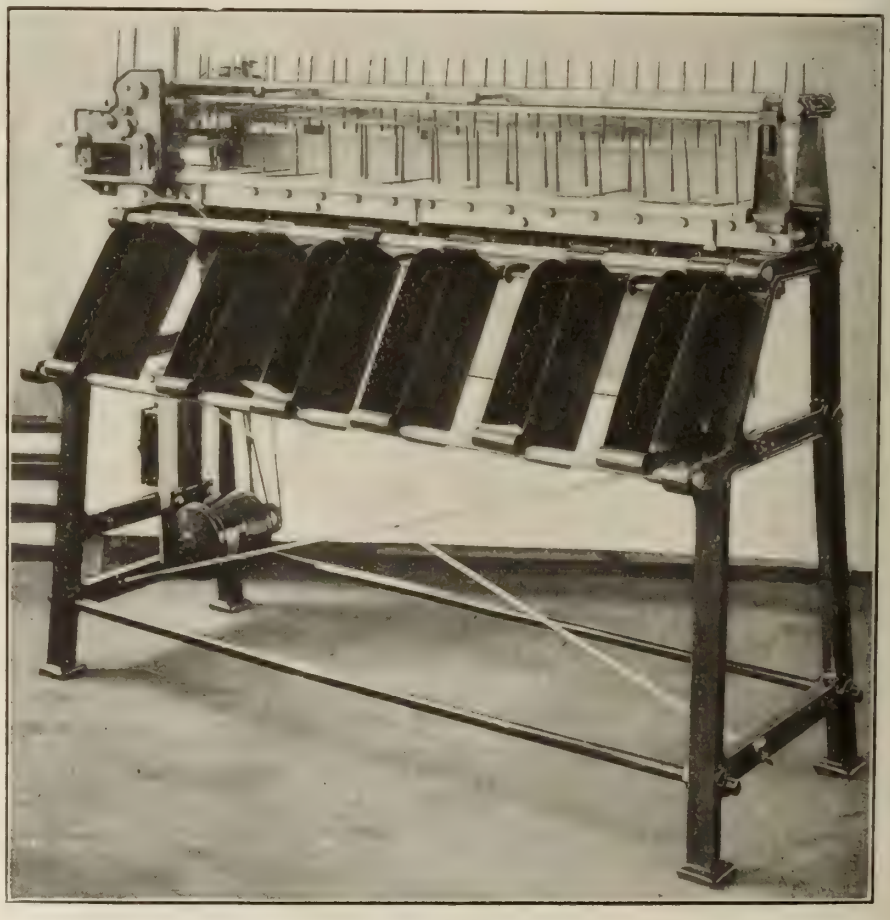


Fig. 2—Census tabulating machine.

Associate Editor, Toronto.

chute. For every ¼ inch of the card's advance, the cam lowers the rod E, a distance equal to one chute. The cam makes one complete revolution for each card that passes.

The Tabulation Process.

Suppose it is desired to tabulate the information contained in the ninth column from the right hand side of the cards. All the contact fingers, except ninth from the right are removed from the machine. The cards are then placed on the table B, and the machine started; the cards being fed in from the bottom of the pile. Any card, perforated to give the third item of information in the column, will have its perforation ¾ inch from the front edge. Let us follow the course of such card through the machine. It is fed in between the spring contacts and the cylinder below. When it has entered to the extent of ¼ inch, the vertical rod E, is at the top of its stroke and about to descend; the card then being opposite the bottom chute. When the card has advanced another ¼ inch it is opposite the second chute from the bottom, but with an advance to the third ¼ inch, the perforation in the card allows the piano-wire springs to make electrical contact with the cylinder below.

This operates a magnet which instantly throws two pawls into gear with two racks cut on the rod E. The latter is thereby prevented from falling further and remains in its then position while while the card enters its chute. The fingers on the endless belts now push the card out of the chute and convey it along the two parallel wires. On reaching the end of the latter, the card falls over into its compartment, and is at the same time recorded by an electrical counter not shown. An attendant removes the cards from the compartments from time to time, the metal boxes seen in Fig. 2, being provided for this purpose. As soon as the card has left the chute the contact timers, seen at G in Fig. 3, render the magnet inoperative, and the rod E, is again picked up by the cam in the course of the latter's revolution.

As the cards are only .006 inch thick, it will be seen that great accuracy was required in making the cams, chutes, and machine generally. With the exception of the electrical equipment, the whole of the work, including the nickel plating and the enamelling of the frame was carried out in Mr. Cleal's shop, under the superintendence of his mechanical engineer, Mr. R. A. Schrag.

Machines of this type are well adapted for the use of banks and insurance companies. The three in question on completion of the census returns, will be employed in the statistical work of the Department of Agriculture, Ottawa.

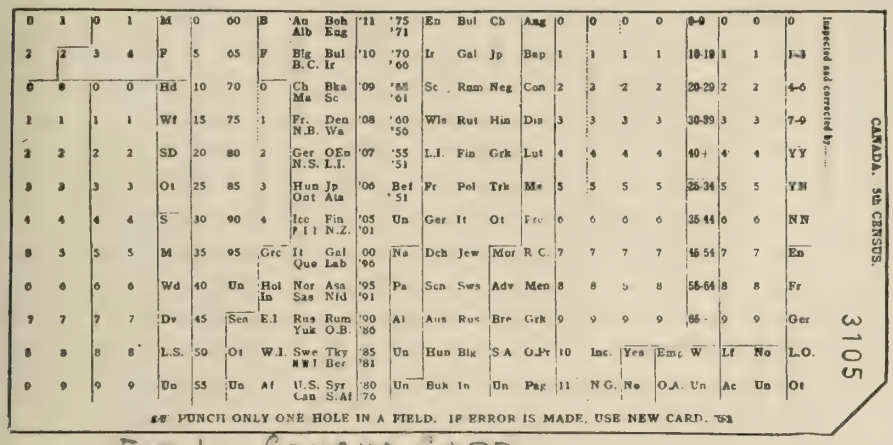


FIG 1. CENSUS CARD

INTERNAL GEAR DRIVES.

The advantage of gears over chains, as a motor-truck drive, may be enumerated as follows: The gears can be properly inclosed and lubricated, and any range of reduction obtained. The differential can be run at a higher speed and hence at less strain and higher efficiency than chains. The bevel gear reduction can be made one to two, while with the chain, the bevel reduction is found to be in general one to three, and one to four. The former, therefore, is a more efficient bevel gear because the efficiency of the bevel gear decreases when the ratio of reduction increases. The side swaying of car causes chains to get out of line, thus increasing wear. The stretch of the chain must be taken care of from time to time by readjustment of the radius rods. Both radius rods must be given uniform readjustment, or the rear wheels will not run in line. Few laymen can do this. Bevel gears are at all times in positive relation to one another and do not require readjustment.

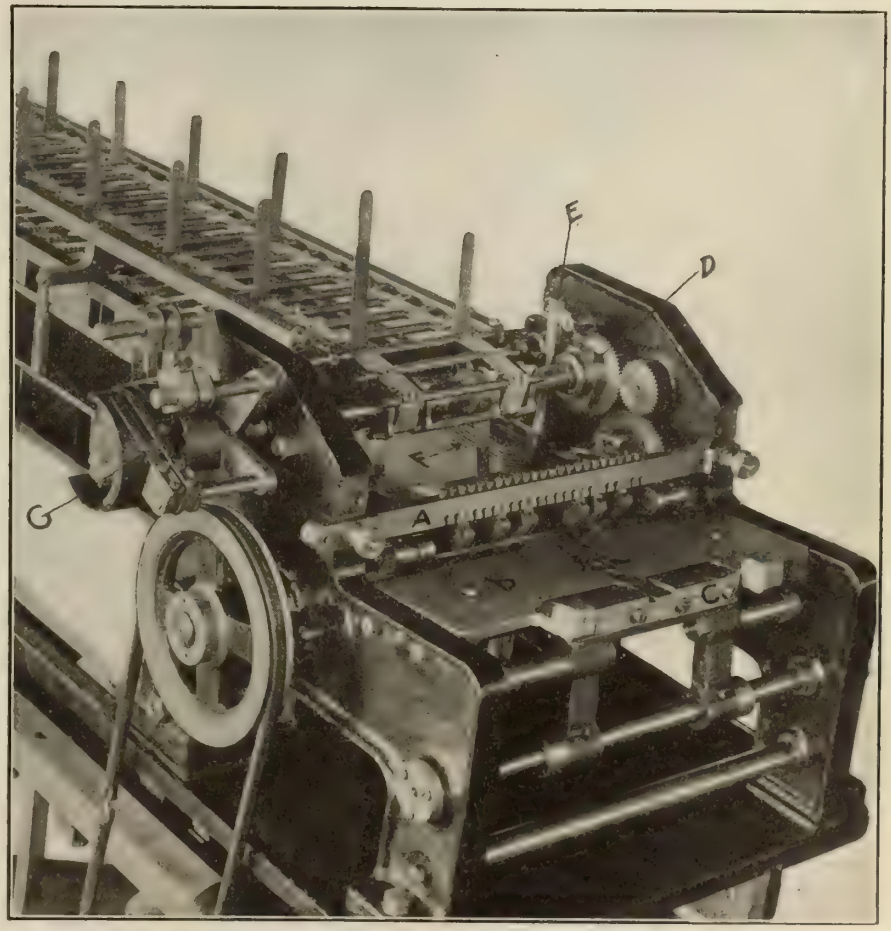


Fig. 3—Census tabulating machine.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

BEFORE leaving the subject of screw threads, let us briefly explain the principle of multiple threads and the method of drawing them.

As previously mentioned, the friction of an angular thread is very high, therefore, large screws are generally made with square threads so as to overcome this trouble. When of coarse pitch, however, square-threaded screws are somewhat weak, since the great depth of the thread reduces the body diameter considerably. For example, let us consider the case of a square threaded screw, 4 inches in diameter and 2 inches

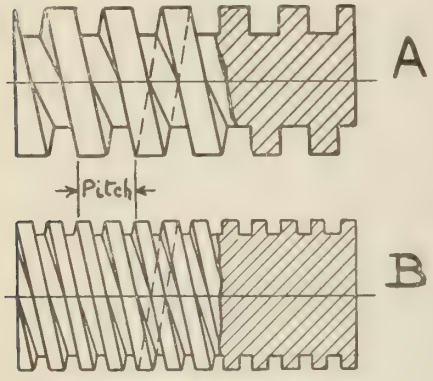


Fig. 1 –Drawing and sketching.

pitch. Since the depth of the thread is equal to half the pitch, the diameter of the body will be only 2 inches, if we make the screw single threaded. By dividing the pitch into two threads parallel to one another, the diameter of the body will be increased, for the pitch (2 inches) will now contain two threads and two spaces, instead of one as in the single example. Also, each thread will be $\frac{1}{2}$ inch wide and $\frac{1}{2}$ inch deep, leaving a body diameter of 3 instead of 2 inches.

Fig. 1 shows the difference between a single and double-threaded screw of the same pitch, the former being shown at A and the latter at B. The pitch may be divided into any number of threads desired; thus, we may have a three or four-threaded screw. Care must be taken not to confuse a four-threaded screw with a screw having 4 threads per inch.

In drawing multiple threaded screws, remember that with the number of threads even, the threads at the top are opposite those at the bottom; and if the number is odd, then the threads at the top are opposite the spaces at the bottom.

Fig. 1 also serves to show the method usually adopted for showing square threads. It will be noted that the threads at top and bottom are joined up by straight lines instead of by helical curves as described in last lesson. The latter method is the correct one, but takes a long time, and is seldom employed except when drawing large screws full size or to a fairly large scale.

Fig. 2 is introduced merely to show the difference in appearance between a right hand thread C and a left hand thread D. For the sake of first year apprentices, it may be as well to explain that a right hand screw is one which revolves when advancing into its nut, in the same direction as the hands of a clock, while a left hand screw revolves in the opposite direction. Thus in Fig. 2, C and D both have the same pitch, but revolve in opposite directions when entering the nut.

For ordinary shop drawings or sketches it is usual to indicate a screw thread by a series of parallel lines as may be seen in Fig. 3. This shows a $\frac{3}{4}$ inch bolt, $1\frac{5}{8}$ inches long. The length of a bolt is always given from the underside of the head to the end as here

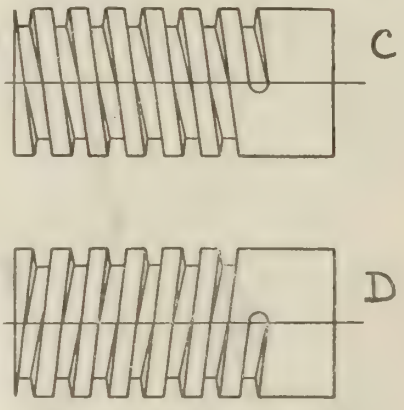


Fig. 2 Drawing and sketching.

shown. The only exception to this rule is in the case of bolts or screws having countersunk heads, where the overall length is usually given. In Fig. 3 it will be noticed that the dimensions of the head are not given, because they are standard.

How to Draw an Eccentric.

Fig. 4 shows an eccentric suitable for a locomotive or small marine engine. To allow the eccentric to be placed in position on the shaft or axle it is split across, the two parts being fastened together by two bolts and cotters. The eccentric is keyed upon the shaft and further secured by two set screws fitted with lock nuts. The screws are cupped or hollowed at the points and hardened, so that they will secure a good grip on the shaft. This sketch has been purposely left incomplete, especially in the plan view, which is supposed to be in section. In drawing the two set screws, care must be taken not to make them

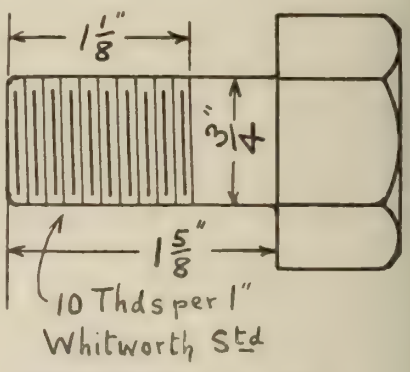


Fig. 3—Drawing and sketching.

so long that they will not go into place. It will be found necessary for this reason to reduce the thickness of the locknut and bolt head to about $\frac{5}{8}$ inch. Except for the length of these bolts all necessary dimensions have been given and the student should have no difficulty in completing the drawing. A scale of 2 inches to the foot will be suitable, or it may be made larger, if desired. First lay down the horizontal centre line of the elevation view. Across this, draw a short vertical line. The point of intersection of these will be the centre of the shaft, which is 7 inches diameter. Three inches to the right of this point draw another vertical line, whose point of intersection with the horizontal centre line will give the centre of the eccentric. It will now be seen that a complete revolution of this eccentric will move the valve 6 inches. The two halves are "dove-tailed" together, the joint being $\frac{3}{8}$ inch deep, which prevents side motion and takes all shear off the bolts. A similar projection, all round the outside of the eccentric, fits into a like recess in the eccentric strap and keeps the latter in place.

*Ninth of a series of an Instruction Course.

Sketching in the Shops.

The student will find it instructive to get around the shop at noon hour, with his rule and calipers. He should practice making free hand sketches of simple parts of machines or engines, taking care to put down all necessary dimensions, and in his spare evenings make proper finished drawings from them. One or two attempts at work of this kind will do more to teach him how to make shop sketches of practical value than many columns of print. Start with easy subjects such as plain pistons, cast iron pipe, etc, and gradually work up to higher things. It does not matter how rough the hand sketch provided all necessary dimensions are given, from which to make a finished drawing.

The student will be surprised at first to find how many needful points or figures he has omitted, and pains must be taken to quickly correct this fault. The ability to be able to make correct and intelligible sketches is a distinct asset to any mechanic, and it needs only a little practice to enable the beginner to see almost at a glance what dimensions are lacking from his sketch.

Exercises.

1.—Draw to any convenient scale a single-threaded screw 2 inches dia. by $\frac{3}{4}$ inch pitch. The thread to be square section and right handed.

2.—Draw a left-handed screw of the same dimensions as the above, but double threaded.

3.—Draw a hollow cast iron piston 12 inches diameter by $4\frac{1}{2}$ inches wide, with core 9 inches diameter by 3 inches thick. The hole for piston rod is 2 inches diameter. Round the circumference of the piston are two grooves for the packing rings. The grooves are $\frac{3}{4}$ inch wide by $\frac{1}{2}$ inch deep and the centre of each groove is $1\frac{1}{4}$ inches from the vertical centre line of the piston.

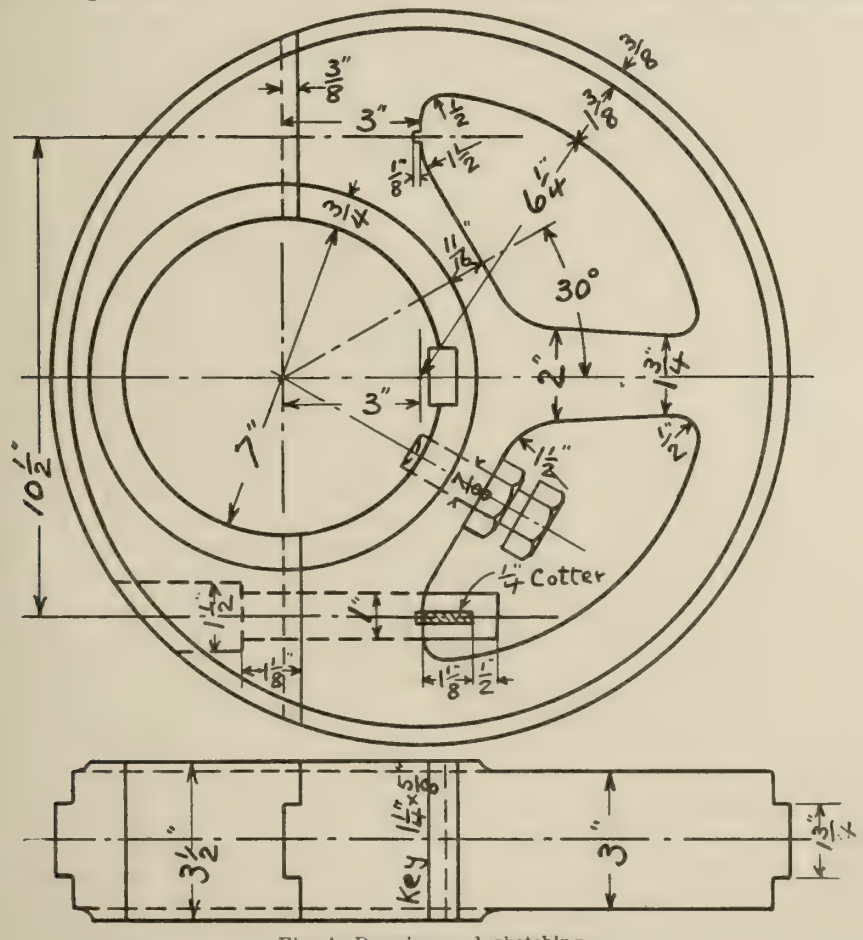


Fig. 4—Drawing and sketching.

A LARGE LATHE.

One of the most powerful lathes ever constructed was recently put into service by the Darlington Forge Co., England. Its massive double-slide bed, 61ft. 6in. long, 16ft. wide, and 27in. deep, is built up in two lengths jointed down the centre with five longitudinal and several transverse box girders, and is so arranged that an additional length can be easily added later.

The lathe, which was built by Messrs. Hulse and Co., of Salford, England, will admit work 40ft. 6in. long and 13ft. 4in. diameter between centres. The fast head stock has two changes of double and two of quadruple machine-cut forged steel gearing, the changes being readily effected by means of racks and pinions. The spindle is 19in. diameter by 27in. length in the front bearing, and 15in. diameter by $22\frac{1}{2}$in. in the back bearing, A large ball bearing is fitted to take the end thrust. The machine is driven direct through machine-cut double helical forged steel gearing by a 100 b. h.p. motor, having a speed variation of 3 to 1, mounted on the foundation plate at the front of the headstock. The keys on the shafts in the fast headstock are forged solid with the shaft, and all the sliding wheels are fitted with two keys. The face plate chuck is 12ft. diameter, cast in one piece, bolted to a large collar forged on the spindle nose. The movable headstock has a forged steel spindle 12in. diameter. Four independent sliding carriages are provided, two at the front and two at the back, with transverse slide and extra holding-down strip. Each is fitted with a rotating nut and reversing gear, swing frame and machine-cut steel change wheels, these latter not only imparting the various rates of feed longitudinally for sliding or screw-cutting, but traversely for surfacing. Rotary motion is transmitted by means of longitudinal shafts driven from one of the quick-running shafts on the fast headstock through two changes of spur gearing; means of hand adjustment being also provided. The sliding carriages have a quick traverse motion in both directions driven direct from a 20 b.h.p. constant-speed motor self-contained with the lathe. The range of spindle speeds is from 0.4 to 30 r.p.m.

THE JANNEY UNIVERSAL VARIABLE TRANSMISSION DEVICE.

Lecturing before the Canadian Society of Civil Engineers, Montreal, Mr. Newman, chief engineer of the Universal Transmission Co., described the construction of the Janney Universal Variable Transmission Device. The paper was chiefly of a technical character, and was illustrated by lantern slides and a working model. Mr. Newman stated that the device, which has been adopted by several governments for operating guns on turrets, was applicable to cranes, automobiles, cars, vessels, locomotives, elevators, and numerous other machines, and he claimed that it was more efficient, and in the end, more economical, than other transmission devices. During the discussion, approval of the idea was expressed, but it was suggested that more experience was necessary before its application could be made commercially possible.

Mr. Moscrop, of the Campbell Gas Engine Co., Halifax, England, who has been looking over the Canadian field for the past three months, returned to England last week. While in Canada Mr. Moscrop appointed agents at Vancouver, Winnipeg and Toronto.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

A PHASE OF EFFICIENCY MOVEMENT.

By Observer, Winnipeg.

ONE cannot help remarking that the movement toward higher efficiency is in its essence and entirety a challenge to labor. It is quite obvious that labor (organized or otherwise) had no part in the birth of any system which guaranteed increased renumeration for more efficient performance. Is it a matter of surprise then, that the ideas and efforts of capital, to induce labor to accept its propoganda, should be treated with some suspicion? Each side has always been prone to discern in the other's best intentioned overtures a motive at least selfish, if not actually hurtful. Industrial development and progress has accentuated rather than mitigated this distrust, until to-day we find the two sections, like Britain and Germany, armed to the teeth alike for offence and defence, and each largely defiant.

I cannot help believing that both capital and labor have much ground for grievance against one another, although I should not venture to express an opinion as to which carries the largest burden in that respect, but I do say that labor has suffered and is suffering most, by its own doings or otherwise in some degree.

Labor Conditions in England.

Speaking recently in Birmingham, England, Bishop Gore, a man of broad views and wide sympathies, said:—"There is a profound sense of unrest and dissatisfaction among the workers. Recently society has been deeply alarmed at its symptoms. I cannot but believe that this profound discontent is justified, though some particular exhibitions of it are not. The longer I have lived in this great industrial centre, the more I have felt that, as Christians, we are not justified in tolerating the conditions of life and labor under which a vast mass of our population is living. We have no right to say that these conditions are not remediable, and we have no right to expect that they will be remedied until Christian hearts and Christian heads energetically demand and insist that they shall be altered."

A well-known newspaper commenting on the foregoing, says:—"No one who has seriously considered the facts and figures can doubt that the bishop is right, and that the working classes are right in asking more and more persistently, whether their share of the products of labor and capital is adequate. There is no reason to be afraid of this discontent of the people, because it is something more hopeful for them than a listless tolerance of their present intolerable conditions."

Labor Conditions Anywhere.

What is true of England is just as true of any country, and be assured no system of scientific management backed up by the "twelve principles of efficiency" will effect the desired remedy. It is much like the methods adopted by churches, young men's Christian associations in reformation work. They wall-in the renegade by precept and regulation to such an extent that he can only exist by propping-up, which, if withdrawn, leaves him more helpless than he was originally and probably worse off. The factory operator who is systematised sinks his initiative and individuality to become an automation, and will probably find when it is too late that there are different degrees of its efficiency, as well as that of men.

If capital or employers would ponder the question for a moment, and realize clearly that accident of birth, opportunity, circumstance and bank balance are after all the main distinctions between them and their employes, and that each man of the latter has a limit of endurance under conditions more or less exacting, there would be fewer whisperings of the octopus tyranny of the former and dastardly tactics of the latter. There are good and bad in each class, which of itself is of course not very comforting, but is it too much to ask of the former, that they influence their fellows, and so bring about a higher sense of duty and of such reciprocial nature, that there will neither be the extreme of loafing on the one hand nor slave driving on the other.

Be sure that the race suicide, which would make a man into a machine wound up at 7 a.m. and 1 p.m., and guaranteed to deliver a definite output each 5 hours, will meet with a more strenuous opposition than that other and perhaps resultant feature with which we have now become so familiar.

MODERN MANAGEMENT NOTES.

WASHINGTON, D.C., Oct. 10, 1911. —The House Committee on Labor recommends that at the regular session of Congress beginning in December the so-called 'Taylor system, and similar systems of shop management be investigated, in order that "whatever may be good in any of them may be approved and applied, and whatever there may be bad may be condemned and eliminated."

Secretary Meyer has appointed a board of naval officers, headed by Rear Admiral Vreeland, to prepare the necessary instructions for putting "modern management methods" into the navy yards. The board will try to determine how to utilize the personnel of ships in making repairs at yards. It will try to decided to what extent naval officers should be trained in the shops; also what proportion of the two years' cruise of midshipmen should be spent in practical work at navy yards. In short, Mr. Meyer will try to systematize operations of the navy yards in such a way as to bring them more in harmony with the most efficient methods of the highest class civil establishments.

STEEL PRICES AND WAGES.

"The possibility of lower wages in the steel and iron trade is being seriously discussed," says the Iron Age, adding: "In the opinion of some manufacturers it is inevitable that labor will share the hardships which the trade is undergoing."

In 1898 nearly all steel and iron products sold at the lowest prices ever known in this country. Partly to remedy that distressful condition the big steel combinations were formed, culminating three years later in the Billion-Dollar Steel Trust. Also, ownership of the best ore and coke supplies were gathered into a few hands. Now the price of sheet steel is as low as in 1898. The labor cost, according to the Age, is two dollars a ton less; but the bars from which it is made are five dollars a ton higher, and "it is hard to see how independent mills are living. . . . . Nor is there any living profit for a wire mill buying its rods at twenty-six dollars and selling plain wire at a cent and forty-five hundredths a pound."

The Trust, of course, doesn't have to buy rods at twenty-six dollars or bars at twenty-one. It makes both out of its own iron ore and coke; and it is not within the power of all the attorney-generals in Christendom to disperse the ownership of the ore and coke as it was in the nineties. The cuts fall hardest upon certain independent makers of finished products, who may have to call upon labor to "share their hardships" as though labor didn't have enough hardships of its own which nobody shares, and though the labor cost, as to sheet steel at least, is two dollars a ton less than in 1898.

That is what free competition usually gets round to—a reduction of wages and then a bigger combination. It is very well known that a great number of steel and iron workers now make barely a living wage, though they perform twelve hours of gruelling labor daily.—Ex.

Shop Floors *

(By Leonard C. Watson.)**

NO floor surface is perfect from every point of view. The question of what floor to adopt for a shop is therefore always a choice between different combinations of good and less good qualities. While the factor of cost is apt to be considered the dominating one, there are many situations in which cheapness is not the most important item in the choice of a floor; or to put the matter a little differently, it is sometimes economy to discard the floor that is cheapest in first cost for a different floor of higher cost and which will justify its higher cost because of its better adaptation to the particular kind of service required of it. Therefore, althongh I have been asked to speak particularly about granolithic floor surfaces for shops, I am not in the attitude of advising a granolithic floor for any and every service under any and all conditions. The granolithic surface has good qualities of great importance and I shall give these qualities due weight; but I shall also point out some of the circumstances under which it may be better in particular cases to use wood floors.

Considerations Affecting Choice.

In first cost, the granolithic floor surface has the advantage over a wood floor; the cost of such a surface laid in the best manner being about equal to the cost of seven-eighths maple flooring delivered at the work. Besides this advantage in cost, the granolithic surface is fire-proof as well as waterproof, and will not decay or disintegrate under washing with water, which latter is one of the weak points of the wood floor.

There are other considerations involved in a decision between granolithic and wood floors, concerning which it is unsafe to be very dogmatic without first defining very precisely the conditions of each particular case. Taking first, such a matter as the wear of these two types of floors, it is easy to see that a wood floor is more easily repaired than a granolithic surface, and that repairs to a wood floor can bring it to the original maximum efficiency. A granolithic surface can also be repaired, so that the new patches will be quite as good as the original surface, but the time and care required is much greater than with a wood floor. In repairing a granolithic surface, it is necessary for best results to cut out the broken or defective portion down to the slab, leaving the cut with vertical edges. Next, the slab must be cut with a sand blast or acid until the aggregate stands out sufficiently to give a good bond for the new surface. Then the slab and edges of the cut, having first been well wetted, must be grouted with neat cement mortar, on which the new finish is laid before the grout has set. Finally, the patch must be kept wet, and protected from use for at least a week. Being rarely possible to satisfy all these necessary conditions, it is therefore true in average practice that repaired portions of granolithic floors are inferior to the original surface in wearing quality.

Workmanship a Factor in Comparisons.

In this contrast between the wood and granolithic floors we have to deal with the question of workmanship. With a maple top floor, the difference in wearing quality between a floor laid by a first class carpenter and the floor laid by a merely average carpenter, is comparatively slight; but with the granolithic finish, ignorant or hasty work is disastrous almost from the outset. The granolithic finish, to give good service, must be laid according to right theory, and every step in the workmanship must be first class. It is not at all difficult to get a first class granolithic surface if one starts out with a determination to have it. Good works costs very little more than poor work. It must be admitted, however, that a great many granolithic floors have been unsatisfactory. Poor workmanship and wrongly chosen materials are the reasons.

Granolithic Surface Operatives' Health.

Among objections which have been raised to the granolithic surface, one of the most prominent is the bad effect of the concrete floor upon the health and comfort of the operatives who stand upon it. There seems to be little doubt that long standing in one position on a concrete floor is not good for the operative. The reason, for such ill-effects as occur, is not the excessive hardness of the concrete floor, as generally supposed, but its great heat absorbing power. Wood is a poor conductor, a poor radiator, and therefore in general a pretty effective insulator; but when an operative stands for hours on a concrete floor, the heat of his body is conducted from his boot soles into the concrete rather rapidly. In consequence of this drawing away of the body heat, feet and legs become more or less chilled, the circulation in the legs is slackened, and pressure on the skin of the feet, coupled with this sluggishness of circulation, due to the loss of heat, may easily give rise to sore feet and to various pains which are commonly classed under the head of "rheumatism."

That these bad effects do occur, has conclusively appeared in investigation of the whole question made by the Aberthaw Construction Company about a year ago. For operatives who are moving about while at their work, or who wear thick-soled boots, this excessive extraction of the body heat by the concrete floor is a negligible matter, but for men working steadily at machines in one position, some insulation is required. It is the practice in many machine shops to give the men footboards or gratings of wood on which to stand. These do away altogether with any ill-effects from the concrete floor.

Durability of Granolithic Floors.

Granolithic floors have been attacked as not sufficiently durable under the rough usuage of the machine shops and foundries. Here, again, we have to take into consideration the all important item of materials, workmanship, and theory of construction. Nothing but the hardest natural stone in the way of a masonry floor can long withstand the wear of heavy trucking. The usual form of truck is provided with small diameter wheels having a flat tread and sharp edges, and such wheels, with the tilting or slewing of trucks, always in evidence in turning corners, will gouge and dig into any kind of floor. The granolithic finish can, however, be made with such a high percentage of tough elastic aggregate, that the wear of trucking is borne almost exclusively by the aggregate itself. Nothing but steel and granite can outwear such a floor. It is the part of wisdom, in laying granolithic floors over which there is heavy truck traffic along certain lines, to provide steel plates or gratings properly set in the concrete to form lanes or tracks for heavy trucks.

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*Paper read at the New York October meeting of the A.S.M.E.

**President, The Aberthaw Construction Co., Boston.

Tools, Processes and Products as Floor Factors.

The nature of the tools, processes and products in a given shop bear on the decision between granolithic and wood floors. An edged tool dropped edge down on a granolithic floor would be damaged by the impact, while the same toql dropped edge down on a wood floor would dig into the wood and probably suffer no damage. Also, a manufactured product consisting of delicate metal pieces would be much more damaged by falling on a cement floor than on a wood floor. Still further, the dust produced by the wear of some granolithic surfaces has proved harmful to delicate machinery in some shops. The wood floor does not of itself produce a dust capable of any visible action as an abrasive. It is possible, however, by glueing battleship linoleum to a concrete floor to get many of the advantages of a wood surface. Tools and small manufactured articles are as little likely to break by falling on a linoleum surface as upon wood. The linoleum is without the innumerable cracks of the wood floor and therefore is much more easily kept perfectly free from dust. Linoleum is also an efficient insulation against loss of body heat to the concrete floor.

High resistance to wear of every sort and practically complete dustlessness, that is to say, freedom from the production of abrasive dust, can be secured in a granolithic surface properly made. It is always better that a granolithic finish should be laid on the floor slab while the latter is still green. A better bond between the finish and the slab can be obtained in this way than is possible after the slab has fully set. Unfortunately, the conditions governing the erection of concrete buildings usually put off the laying of the floor finish until all the rest of the building is practically completed, and this involves the need of using great care in cleaning and roughening the slab surface, so that the granolithic finish laid upon it will get the best possible bond with the slab. Ordinarily, the finish need not be more than three-quarters of an inch thick. Both for wearing capacity and for the avoidance of dust through abrasion of the concrete, the granolithic finish should contain the highest possible proportion of tough stone aggregate.

Constituents for Durability and Dustlessness.

For the most durable and most nearly dustless floor, my rule is this: First, it is better to use no sand; sand grains are brittle, are early broken by the abrasion of feet, and cause dustiness. Use for an aggregate, a stone suitable for macadam road, taking the sizes that pass through a half-inch round mesh screen, and nothing smaller than that passed by a 20 mesh screen. Mix the concrete dry, of a consistency used in making blocks, so that considerable tamping will be required to bring to the surface enough water for trowelling. Finally, do the trowelling before the mortar sets.

It is practicable in this way to get a surface that is 90 per cent. hard stone. The mortar, of course, wears more quickly, but its small area makes the results of this wear unobjectionable. Prolonged trowelling of a wet mixture brings to the top the "laitance" of the concrete, which is the part incapable of a true set. A top layer of "laitance" is therefore porous and wears down quickly. Even fine particles of good cement should not be brought to the top, for they form a layer which is weakly bonded to the rest of the concrete, which wears away quickly, and appear in the air as dust.

The Joliette Steel and Iron Foundry Co., Ltd., Joliette, P.Q.

By L. G. Dennison, B.A., B.Sc.

Being a brief outline description of the Dominion's latest steel foundry enterprise, and which has proven by operation and output to be able to cater to and command a steady and important machinery manufacturers' connection.

THE progress of Canada's development is daily indicated fully and clearly by the addition of new plants to cope with the increasing demand for new or larger quantity industrial products. The Joliette Steel & Iron Foundry Co., Joliette, P.Q., have recently introduced themselves to purchasers of steel castings, and as showing their entry into this domain to have been warranted, and their ability to deliver both quantity and quality output, projected extensions are already on the tapis to meet insistent demand. Iron foundry products as well as those from the steel foundry form a large part of the firm's business. Each is, however, distinct from the other, and only that referring to the steel section will be dealt with in this paper.

The buildings occupy a ground area 90 by 120 feet, to which a length addition of 50 feet is immediately contemplated. The power house is located at the rear of the right wing.

Foundry Equipment.

The main molding floor is served by a 45-foot span crane of 30,000 pounds capacity, manufactured and installed by the company, and operated by three Westinghouse D.C. motors of 5, 7 and 10 h.p. respectively. The cupola and converters are placed at the rear end of the foundry, the two latter being set low, and with the ground dug out in front for ladle filling convenience. The cupola is set on the first platform and



Joliette Steel & Iron Foundry, Ltd.—Main W orks Building.

* Associate editor, Montreal.

charged from the second, to which the charging material is carried by an elevator. The port of the cupola is about 7 feet from the edge of the platform, and discharges into a trough about 7½ feet long with a hole in the bottom just beyond the platform edge. This in turn discharges into a trough exactly similar to the other except that it is capable of swinging, so as to pour into the converter or ladles placed within its 7 feet radius.



Joliette Steel & Iron Foundry, Ltd.—Foundry Interior.



The Joliette Steel & Iron Foundry, Ltd.—Steel Y-Pipe Casting.

Ten, five, three and one-ton ladles, together with the usual smaller units form an equipment both serviceable and highly satisfactory. A full and varied assortment of molding boxes of latest pattern lends facilities for overtaking work of much variety of size and form.

The drying ovens 11 by 15 by 8 feet high are provided with convenient shelves and truck tracks reaching out into the shop for crane loading or unloading purposes.

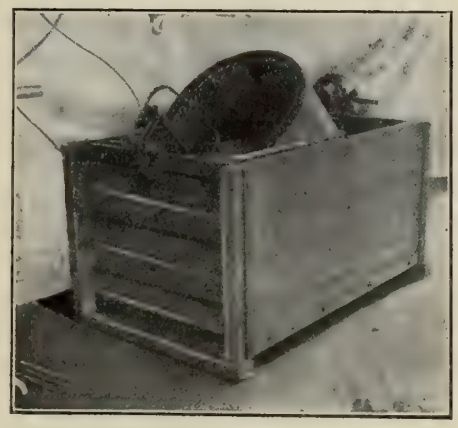
Power Equipment.

Power is obtained from S. Vessorts' hydro station on the river, and the main drive is from a 40 h.p., d.c. motor. A shunt wound dynamo supplies current of 220 volts to the overhead crane, and a 115 volt, 130 ampere machine takes care of the welding section. Compressed air is of course largely used throughout the plant for the operation of labor saving tools, etc. Altogether, this plant has the nucleus of great possibilities, and we believe that at no very distant date, increased success and growth will be the portion of its promoters.

MECHANICAL PLATING BARREL.

A new mechanical plating barrel has been invented and patented by G. L. Wallace of the Harshaw, Fuller & Goodwin Co., New York, who are placing it upon the market. As will be seen from the illustration the barrel is a combination of the horizontal and oblique types of plating machines, the advantages of both being obtained. Thus the large quantity of solution used in the horizontal type is combined with the convenience of the oblique barrel as regards inspection and removal of the work. The barrel bottom is perforated and covered with cocoanut matting; this having been proved durable and satisfactory for the purpose. Two inclined rolls in the bottom of the tank support the barrel, which is driven by a spur gear at the end.

Inside and out side anodes are used, and the inside anode, located directly over the work, is so fastened that it can be swung out of the way when the barrel is removed. The cathode connection is hinged for the same reason.



Mechanical Plating Barrel.

The barrel is 30 inches diameter by 30 inches deep and is probably the largest made.

STRENGTH OF CAST IRON.

By. C. T. R.

A LARGE volume of data has been presented by various observers, dealing with the influence of the well-known metalloids upon the strength of cast iron. Silicon, sulphur, phosphorus, manganese and carbon combined and graphic, have all been shown to produce effects more or less pronounced, and close attention to these elements is a matter of importance to every foundryman operating along modern lines. It is now one of the first essentials in foundry practice to become familiar with these ingredients of cast iron, and to maintain a vigilant care that their percentages remain within limits that are best suited to the type of work that is being made. By so doing, a very large proportion of foundry troubles can be avoided, and with the knowledge thus afforded, it is possible to locate, readily, casting difficulties that may arise.

It is not the intention at present, to deal with this branch of the subject, but rather to direct attention to the fact that even when the composition of iron in relation to the common metalloids is maintained at a standard, the strength of the metal as shown by test bars may vary widely. The writer has met with cases in which for a period of some weeks, the transverse strength, of one inch square bars broken on twelve inch centres, has run 200 to 300 pounds lower than the standard strength for the foundry in question, falling, let us say, from an average of 3,000 pounds to an average of 2,700 pounds.

Variation in Transverse Strength.

The causes of these conditions are far from being as well understood as we could wish, but they are generally traceable to melting conditions, either in the foundry or in the blast furnaces, where the pig iron has been produced. It has become more common to meet with references to oxidized metal during recent years, although the nature of the oxidization is not very clear. The numerous alloys on the market, as correctives of this oxidization, find their sale largely through a reality of the condition. It seems strange that oxidation of a metal containing considerable percentages of silicon and carbon should

occur, and until the subject is made clearer, it is not well to place too much emphasis upon the descriptive term "oxidized," although the term serves to describe a condition, and in the meantime may be accepted. The foundryman who is responsible for the evils due to faulty cupola practice, should make sure that the conditions of melting that he is following are correct. He should take particular care that the coke bed is maintained at the



Fig 1.—Microphotograph of Coarse Bronze Powder.

correct height, for if it falls too low, oxidized metal will probably be the result; while if it rises too high, not only will fuel be wasted, but it is believed that the the condition of the carbon in the iron may be so modified as to yield a weaker casting. In relation to blast, there has of late been a growing conviction that high pressure, once quite popular with some melters, is a mistake, and that the most desirable condition provides for an ample volume of air at very moderate pressure. Charging should be uniform and level, while quantities of scrap, either excessively rusted, or otherwise undesirable, should be avoided.

Melting Conditions at Blast Furnaces.

When all has been done by the foundryman, under conditions which are standard, and every precaution has been taken to ensure good results, the fact remains that melting conditions at the blast furnace may produce a pig iron with the correct percentages of metalloids indeed, but yet unsuitable for producing the best casting, especially with relation to strength. This is a matter calling for the attention of the furnace manager. The nature of the ore smelted, particularly in regard to the ease with which it is reduced, seems to enter into the problem, and it is known that furnaces using a large percentage of mill cinder, which is not easily reduced, do not produce the most desirable grades of pig, from the standpoint of the foundryman in search of strong castings.

We do not wish to place too much emphasis upon this phase of the subject, as the furnace is too frequently blamed for the faults of the foundry, but we believe, nevertheless, that there remains a field for investigation in regard to the influence of the ore upon the grade of the resulting pig iron. The subject is still in the controversial stage, and there are those who maintain that the furnace burden does not enter into the matter, except in so far as it influences the percentage of the well recognized metalloids. It has come under the observation of the writer that irons from the same furnaces, and of practically the same analysis have given widely different strengths under standard cupola practice in more than one foundry. At the same time, and under these conditions, it seems most reasonable to assume that the cause lies in the general conditions prevailing at the blast furnace.

BRONZE POWDERS AND BRONZING.

A Commission recently appointed by the British Government to inquire into the condition of the bronze powder and bronzing industry in England with reference to the health of the employes, have rendered their report.

They say, in their report, that bronze powders are made mainly in Nuremberg, Furth, and neighboring towns in Bavaria. They are not made in England and consequently they were not able to see the process of manufacture. They state as follows: "We are informed that the powder is produced from thin sheets of metal leaf by rubbing them through the meshes of fine wire sieves, and that the waste from metal leaf (Dutch metal) factories, in addition to new metal, is used for this purpose. After the addition of oil, the mixture is ground in suitable machines to the requisite degree of fineness; the greater part of the oil is then extracted by placing the mass in water and then subjecting it to strong pressure."

Several analyses of bronze powders were made in the Government laboratory and the following results were obtained.

The green, pink, violet and other colored powders are the regular bronze powders colored with analine dyes. The largest consumers of bronze powders are the lithographers.

The investigation indicated that bronzing machines are now supplanting hand bronzing, with the accompanying safety of the operatives. Bronze powder inhaled does not have the bad effect of emery or steel dust from grinding operations and is not apt to bring on pulmonary troubles like them. The dust is not sharp as they are, and does not penetrate the muscles of the throat. The effect of bronze powders is more of copper poisoning than that of dust.—Brass World.

AVOID BEING A QUITTER.

"The man who tries and fails, may oftentimes be excused, because of his attempting that for which he was not prepared, but oftentimes the unprepared

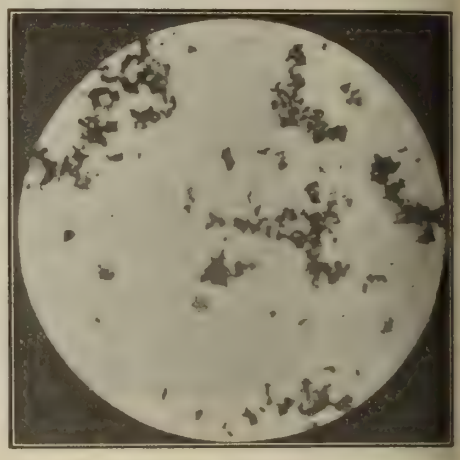


Fig. 2.—Microphotograph of Fine Bronze Powder.

man gives up when failure seems to be hanging over his head—he is a quitter and is shunned by his fellow men—it's hard to respect the man who has lost faith in himself, and it's few who do respect him. Oftentimes a few encouraging words from a close friend prevents a man from letting go his hold on this life. If we could but know when a man is ready to quit, a great many, so-called, failures would not be—but the line between success and failure is so fine that at certain times one never knows upon which side his shadow falls. Failure which comes from giving up hope, is merely the evidence of manhood which is lacking. Manliness is one of the most respected virtues which we may possess; it will with the help of health and industry bring that prosperity which so many men desire; so create it, cultivate it, should it not be inborn, and thus prepare thyself against those things which make out of man—a quitter."

The effect of vacuum upon the steam consumption of a turbine is strikingly shown by the reports of a recent test on a one thousand-killowatt machine in which the consumption increased forty per cent. with a decrease in vacuum from twenty-nine to twenty-one inches.

It's rash to wish all the fools were dead. Some of our best friends would be missing and lots of us who remained would have to move down several notches in the scale of merit.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

Moose Jaw, Sask.—The Saskatchewan Bridge and Iron Co., capitalized at $250,000, have decided to establish here. They will manufacture bridge and structural iron work on a large scale, including machine building, boiler making and repairing, iron and brass founding. The main building of the new plant is to be 200x90 feet. Excavation will probably be completed this fall and the building will be proceeded with in the early spring.

Calgary, Alta.—At the annual meeting of the C.P.R. held recently in Montreal, it was decided to award the new Western shops to Calgary. Nothing definite as yet can be learned about the size of the buildings or the estimated cost. In addition to repairing the rolling stock, cars for the system in Western Canada will be built here.

New Westminster, B.C.—The Hamilton Steel Works, of Hamilton, Ont., have secured a splendid site here on the waterfront at a cost of $700,000 and will proceed to erect a plant.

Ingersoll, Ont.—The John Morrow Screw, Ltd., will still further increase their plant here during the present year. They will erect a $15,000 building for the manufacture of twist drills.

Medicine Hat, Alta.—W. R. Martin and others are establishing an industry here to manufacture gas drilling tools.

Smith's Falls, Ont.—An addition is being made to the foundry of Frost & Wood at a cost of $25,000.

Amherst, N.S.—The new car shops in place of those which were burned out some months ago, are rapidly nearing completion. A new varnish shop 160x50 feet and a large extension to the passenger shed, 200x160 feet is also under construction. An order for 1500 box cars and eight snow plows has been received from the C.N.R. and another order has lately been placed for thirty gypsum cars for a Newfoundland company.

Welland, Ont.—There is a possibility of the Union Furnace Co., of Buffalo, locating in Canada with a view to assembling Lake Superior pig iron for conversion into car wheels. The company is owned and operated by L. C. Hanna & Co., of Cleveland, and has five furnaces in operation in Buffalo.

Calgary, Alta.—Craddock & Sweeney have secured the contract for the erection of the civic storehouse and machine shop in Victoria Park. Their tender is $29,292.95.

Farnham, Que.—The Pickering Patent Wheel Co. are establishing a factory here to manufacture all kinds of wheels.

Granby, Que.—The ratepayers are being called upon to grant a loan of $5,000 to the Granby Hardware Co., who desire to establish here.

Vancouver, B.C.—The plans of the C.P.R. regarding the establishment of shops at Coquitlam will not be effected by the establishment of shops at Calgary. In connection with the new freight terminal and distribution yards at Coquitlam, car-building and repair shops will be established to look after the needs of the system in British Columbia.

Vancouver, B.C.—$2,000,000 of English capital has been secured for extending the business of E. H. Heaps & Co., lumber manufacturers. Arrangements have been completed for the erection of modern machine shops for the manufacture of internal combustion engines, motor cars, taxi-cabs, commercial trucks and motor fire apparatus. The machinery for this portion of the enterprise will be imported from England.

Fort William, Ont.—H. J. Varlow, late of the C.P.R. mechanical department, has opened a new machine shop here on George Street. He will do all kinds of repairing and make a specialty of brass founding. Mr. Varlow will also instal machinery for making repairs to gasoline engines, valves, brass work in the rough, besides all kinds of mechanical engineering, steam-fitting and steam heating.

Prince Rupert, B.C.—Mr. Love has opened a new machine and engineering shop here under the title of the Imperial Machine Works. The equipment consists of all the necessary machines for repairing machinery and engines, as well as general manufacturing.

Port Arthur, Ont.—An industry, the directorate of which is composed entirely of women, is looking for a site in Canada for the location of a plant for the manufacturing of steel tanks. Industrial Commissioner Neill is endeavoring to secure this industry for the city. The company is operating plants in the United States and owing to the great demand for their product, they have decided to establish another plant. The barrels are electrically welded, not a single rivet being used in the construction.

Brandon, Man.—The McConnell Iron Works have purchased the plant of the Brandon Implement Co. and are now in control of the property known as the Brandon Machine Works. They will carry on an extensive repair business and engage in certain lines of manufacture.

Transcona, Man.—The total cost of the G.T.P. shops here will be about $6,000,000 and from three to five thousand men will be employed. When finished, the pay-roll will aggregate from $300,000 to $400,000 a month.

London, Ont.—Work will soon be undertaken on the new civic workshops and storage houses to be erected by the waterworks department.

Sherbrooke, Que.—The Canadian Rand Co. are erecting a 100 ft. addition to their present foundry, adding 75 feet to their other shop and erecting a large building for the storage of patterns. Several new and up-to-date machines are also being installed in their machine shop.

Ottawa, Ont.—It has been announced that Ottawa and Montreal have won out against the West and will be the sites for the big repair shops and work shops for the Canadian Northern Railway.

Winnipeg, Man.—The Great Northern Railway has awarded to J. McDiarmid Co. the contract for all the new Winnipeg shops to be located at River Heights. The structure to be erected this fall includes four stall engine houses, a yard office, section foremen's house, coaling platform and some other small buildings. The site will be known as Oak Point Junction.

Vancouver, B.C.—Steps are being taken by Vancouver capitalists to establish a steel rolling mill at Steel City. At a meeting of those interested, in the office of G. M. Gibbs, W. Brown, a prominent engineer, outlined the plans and a company for the time being, capitalized at $200,000, has been organized.

Berlin, Ont.—The Ontario Adjustable Hub & Wheel Co., capitalized at $100,000, contemplates establishing here. They will manufacture a hub for wheels used on automobiles, wagons and other vehicles.

West Toronto, Ont.—A $30,000 addition is being made to the plant of the Russell Motor Car Co.

Wilcox, Sask.—Wallace & Hadley have about completed a new machine shop and garage at a total cost of $10,000. The building is 100 x 28 feet, with a separate office 20x22 feet.

Fort William, Ont.—The Universal Truck Co. contemplate establishing a plant here.

Hamilton, Ont.—The Overland Automobile Co. are taking steps to build a plant at some point in Ontario.

London, Ont.—The Harding Automobile Co. have been offered inducements to transfer their plant from here to Newmarket.

Clinton, Ont.—The Clinton Motor Car Co., capitalized at $100,000, will locate a factory here.

Woodstock, Ont.—The assets of the Maximilian Tool & Machine Co. have been sold to W. D. Karn, a director of the company, for the sum of $6,500. The company was formed by J. B. Porter, of Buffalo, to manufacture pneumatic hammers.

Peterborough, Ont.—The assets of the Rapid Tool Co., insolvent, are being offered for sale.

Sudbury, Ont.—The Sudbury Construction & Machinery Co. have erected a large addition to their present plant. It consists of a building 80 x 120 feet, of cement and steel construction throughout. The building is being equipped with a twenty-ton travelling crane and the very latest patterns of machine tools. It will be ready for occupation by the first of the new year.

Ottawa, Ont.—The C.P.R. roundhouse which is being built at a cost of $50,000 will be completed by December 1st. Close to the roundhouse a store and oil house will be built.

New Westminster, B.C.—The Schaake Machine Works, 325 Front street, have made application for lease of several water lots on Lulu Island as site for machine works, to cost $50,000.

Port Arthur, Ont.—It is the intention of the Atikokan Iron Co. to double the capacity of their furnace plant at Port Arthur, and to establish a foundry.

Welland, Ont.—The Rolling Mill Department of the Canadian Steel Foundries, Welland, Ont., which is undergoing improvement, will likely be in operation some time in December.

MUNICIPAL.

Calgary, Alta.—Several improvement by-laws were passed by the burgesses. Trunk sewer, $14,000; conduit extensions, $30,000; sewer connections, $42,000; waterworks extensions, $395,000 and street railway extensions, $375,000.

Durham, Ont.—The ratepayers have given their assent to a by-law to raise $8,000 for a waterworks system.

North Vancouver, B.C.—The ratepayers passed the money by-laws for streets maintenance, waterworks, school site purchase and fire protection.

Wynyard, Sask.—The town council passed a by-law to raise $7,000 for a municipal rink.

Melita, Man.—The ratepayers defeated the gas by-law calling for an expenditure of $4,000.

Dunnville, Ont.—A by-law calling for an expenditure of $21,000 for a waterworks system will likely be submitted to the ratepayers.

Forest, Ont.—The ratepayers will likely be called upon to authorize the installation of a waterworks system.

Sombra, Ont.—The municipality is taking steps to borrow $6,000 for drainage purposes.

Claresholm, Alta.—The town is taking steps to install a waterworks system at a cost of $8,500.

Moose Jaw, Sask.—On November 3, the ratepayers will vote on a by-law to raise $550,000 for the purpose of extending the waterworks.

Wainwright, Alta.—On Nov. 2, the ratepayers will be called upon to vote $7,000 for the purpose of building a municipal rink.

Edmonton, Alta.—A vote was taken in Edmonton to see whether the city would grant a franchise to the Universal Gas Co. or erect a municipal plant and the latter was favored by a large majority.

Galt, Ont.—The by-law to raise $10,000 for waterworks purposes was carried by the ratepayers.

Regina, Sask.—The following by-laws were passed by the ratepayers: Street Railway, $400,000; trunk sewer, $150,000; waterworks, $150,000; subway, $120,000; sidewalks and pavements, $77,800 and exhibition buildings, $35,000.

St. Boniface, Man.—There is a movement on foot here looking towards the establishment of a gas plant.

Edmonton, Alta.—During the coming financial year, upwards of $1,000,000 will be expended on waterworks and sewers.

ELECTRICAL.

St. Mary's Ont.—The Niagara power extension by-law to raise $15,000 for electric power distribution was passed by the ratepayers.

Innisfail, Alta.—The ratepayers have sanctioned a by-law to raise $15,000 for an electric light and power plant.

Waterford, Ont.—The ratepayers will shortly be called upon to pass a by-law providing $7,000 for the installation of an electric light plant.

Berlin, Ont.—The Ontario Railway and Municipal Board has validated the by-law to raise $20,000 for improvements to the lighting plant, which the ratepayers defeated.

Lindsay, Ont.—The ratepayers carried the by-law to grant a franchise to the Electrical Power Co. Two by-laws were before the people, one to give the franchise and the other to buy the local plant and inaugurate municipal ownership.

Thamesford, Ont.—The ratepayers passed two by-laws, one to purchase power from the Hydro-Electric Commission, and the other to raise $6,000 for a local plant and appliances.

Ridgetown, Ont.—At the coming municipal elections the ratepayers will likely vote on the question of buying the local electric light plant from W. H. McMeekon.

Outlook, Sask.—The council is endeavoring to secure an electric light plant for the town. Several estimates have been submitted but they have been considered prohibitive.

SAW AND PLANING MILLS.

New Westminster, B.C.—The Crown Timber & Trading Co., of Vancouver, are establishing a lumber mill here to serve the interests of British Columbia and Alberta.

Brantford, Ont.—Avey & O'Laughlin Lumber Co.'s planing mill suffered a loss of $1,000 by fire

Chatham, Ont.—The large saw mill of Neil Watson, of Mull, was completely destroyed by fire recently. The loss is estimated at $10,000, with only $1,500 insurance.

Grandview, Man.—T. A. Burrows' planing mill at Birch River was damaged by fire, but the loss is fully covered by insurance.

Calgary, Alta.—The Riverside Lumber Co. will erect a box factory here as an addition to their already large plant. It will employ about 100 more men.

Fort Frances, Ont.—The Heins Lumber Co. are contemplating the establishment of a saw mill and plant here.

Rock Island, Que.—Butterfield's have about completed their new wood shop, and will employ eight men.

Bedford, Que.—Best Bros. are building a sash and door factory here, 36x50 ft. and equipped with the latest modern machinery. An electric light plant will be run in connection with the factory.

BUILDING NOTES.

Montreal, Que.—The C. P. R. announce that they will spend over five million dollars in extending and rebuilding hotels. The whole system from the Atlantic to the Pacific will undergo extensions and alterations.

Vancouver, B.C.—Plans have been filed for the new Dominion Government warehouse to be erected at a cost of $330,000. It will be six storeys high and 104x120 feet.

Guelph, Ont.—The new Homewood Sanitarium is being rebuilt at a cost of $200,000. The work will be completed by April 1, 1912.

Vancouver, B.C.—$500,000 covers the estimates of the contractors ror the steel viaduct across the arm of False Creek. The ratepayers will be asked to vote the necessary money at the forthcoming elections.

Kingston, Ont.—Boston capitalists are preparing to erect a $200,000 hotel here next spring. The city is being asked to guarantee the bonds of the company to the extent of $100,000.

Vancouver, B.C.—Oliver Lightheart has prepared plans for a seven-storey apartment house, to cost about $300,000.

Calgary, Alta.—T. J. S. Skinner will erect a ten-storey block here, to cost about $250,000.

Toronto, Ont.—The publication board of the Baptists are preparing to erect an eight-storey building here. This announcement was made at the Montreal convention recently.

Victoria, B.C.—The Oddfellows are contemplating the erection of a three-storey building, to cost $140,000.

Victoria, B.C.—Atkinson & Dill, contractors, have secured a permit for a six-storey building to cost $126,000. There will be 105 offices, each with hot and cold water connections and steam heat.

Toronto, Ont.—Geo. Wright, part owner of the Caer-Howell property, is having plans prepared for a ten-storey apartment house, to contain 42 suites.

Moose Jaw, Sask.—The Canadian City & Town Properties Co. are preparing to erect a five-storey building here, to cost about $300,000. It will be 108x125 feet.

Yorkton, Sask.—The Sisters of the Sacred Sacrament, of Anton, France, are preparing plans for a $150,000 hospital to be located here.

GENERAL MANUFACTURING.

Galt, Ont.—F. T. & C. Appleby are erecting a plant here for the manufacture of cement blocks, sills and brick.

Fredericton, N.B.—The John Palmer Co. will erect a larrigan factory plant here, to cost $25,000. The new building will be of brick and stone and 250x50 feet.

Toronto, Ont.—The Standard Silver Plate Co. will erect a factory on Madison Avenue, to cost $75,000.

Orangeville, Ont.—The Hamilton & Lewett Knitting Co., of Glencoe, contemplate establishing a factory here.

St. Stephen, N.B.—The Buffalo Fertilizer Co. propose building a wharf and warehouse here to cater to the eastern trade. They expect to invest $25,000 in their buildings and plant.

London, Ont.—The Greene-Swift Co. will add a three-storey addition to their plant here in the spring.

Tavistock, Ont.—Bennewitz & Shultz, of Toronto, contemplate establishing a factory here to manufacture accessories for musical instruments. They are seeking a loan of $6,000 from the town.

North Battleford, Sask.—The North Battleford Manufacturing Co. has decided to enlarge its plant and will erect a $50,000 factory.

London, Ont.—The Battle Creek Toasted Corn Flakes Co. are contemplating the erection of a $65,000 factory in the east end.

Welland, Ont.—The Bratton Automatic Sales Co., manufacturers of peanut, weighing and gum machines, are establishing a factory here.

Sarnia, Ont.—$500,000 will be expended in extending and improving the plant of the Imperial Oil Co. here.

Vancouver, B.C.—It is said that $2,000,000 English capital has been secured for the extension of the E. H. Heaps & Co. lumber business. The company are now operating a sawmill, planing mill and a sash and door factory in the east end, an Burrard Inlet. New mills on a larger scale will be erected alongside the existing plants. A sawmill will also be erected at Ruskin; also a planing mill and a sash and door factory.

South Vancouver, B.C.—The Coast Lumber & Fuel Co. will establish a distributing plant here. New buildings will be erected and about 100 men employed.

NEW EQUIPMENT REQUIREMENTS.

Welland, Ont.—The Canadian Automatic Transportation Co., head office, 703 Confederation Life Bldg., Toronto, C. H. Craigie in charge, require lathes, drills, shapers, etc., all machine shop appliances, for their factory. Shop is electric driven and has electric heating.

Weymouth, N.S.—The Blackader lumber mill, near Weymouth, N.S., was totally destroyed by fire October 4th, loss $25,000. They intend building at once a wooden structure and equipping it with all required machinery in their line; steam plant, turbines, steam heating, dynamos, piping, saws, planers, etc.

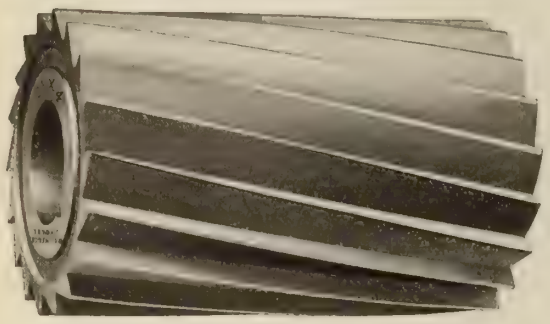
Walkerville, Ont.—Work is in progress for erection of a factory for the Auto Top Co., three-storey, 250x81, electric lighting, steam heating. Machines for making auto tops, engines, boilers, etc.

Brandon, Man.—Cold storage building, cost $15,000, for Brandon Creamery Co., Brandon; contractor, A. Newert, Brandon; two-storey, brick exterior, electric lighting, gravel roof, steam heating, fire escapes, refrigerators, telephones, dynamos, motors, etc.

Walkerville, Ont.—Equipment is required for power plant for Ford Motor Co., brick construction. Telephones and elevators, boiler and engines to be purchased.

Calgary, Alta.—The Crown Lumber Co., grain exchange, will build a new store, cost $5,000; frame, 32x125; electric light will be installed and mill machinery required.

Chatham, Ont.—The McGeachy Dairy Co., Chatham, will install boiler and engine and latest dairy machinery and electric fittings



Hardening a Cutter is the only process in its manufacture that does not depend upon mechanical means for its success.

The first steps in the manufacture of accurate cutters—turning the blank, boring, cutting the teeth, etc.—are dependent upon accurate mechanical means. The same is true of the last step—sharpening.

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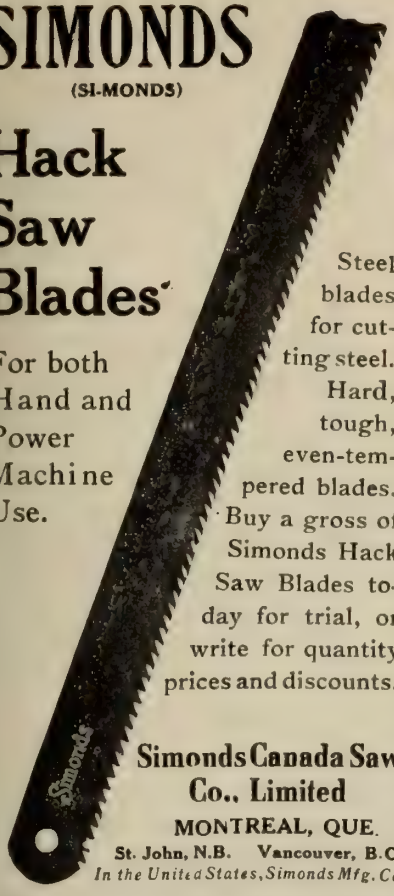
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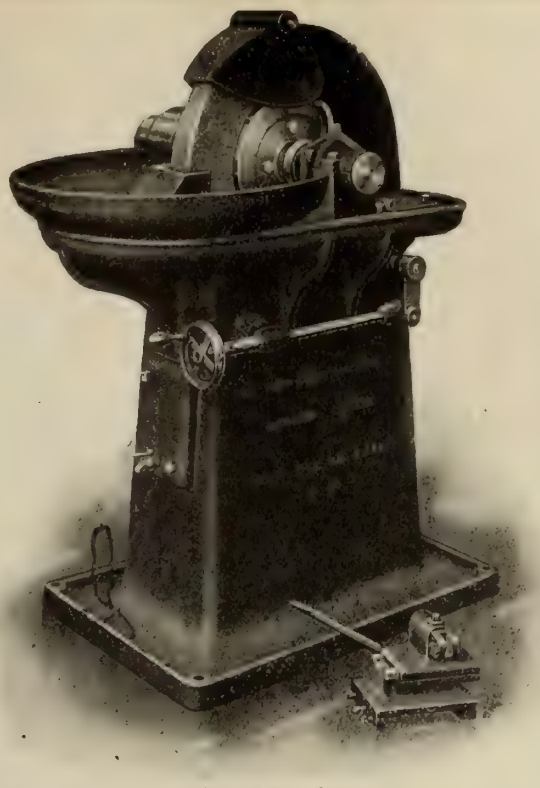
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Steel blades for cutting steel. Hard, tough, even-tempered blades. Buy a gross of Simonds Hack Saw Blades today for trial, or write for quantity prices and discounts.

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Take the Tool to the Work and Save Heavy Handling

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"He must know before he begins it that he must spend money—lots of it.

"Somebody must tell him that he cannot hope to reap results commensurate with his expenditure early in the game.

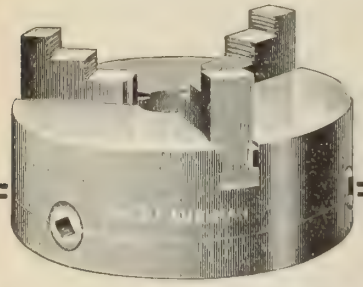
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Special Dies
Special Reamers

Unless you have special appliances, you can get these tools from us better and cheaper than you can make them.

We have the equipment and the experience. Ask us for prices.

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is now ready. Better write for it. It's free on request.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.
Established 1862



and steam heating in the new factory. Building now in course of erection.

Calgary, Alta.—Work is in progress for erection of a laundry to cost $10,000 for Christie Bros.' Ontario Laundry; two storeys, 50x130, solid brick and concrete, concrete foundation, steam heating, electric lighting, gravel roof, concrete interior finish, boilers, engines, dynamo, laundry machinery. Excavation being done. Contract for superstructure not settled yet.

Delhi, Ont.—The Delhi Canning Co. contemplate extensions. New machinery required.

Galt, Ont.—Machinery required for a factory for Canadian Motors Limited; engine, boiler, presser, lathes, etc. Brick and concrete; architect, Wm. Scott, Galt.

Lake Nominingue, Que.—Sawmill destroyed on the 5th inst.; loss, $30,000. It will probably be rebuilt. Company will require hydraulic turbines, dynamos, steam power plant, saws, planers, piping, hose, etc.

Brockville, Ont.—Extension to factory to cost $2,500 on Mill Street, for D. H. Burrell & Co., Brockville. Masonry contract, Haggarty & Co., Brockville; two storeys, 35x42, brick, exhaust-steam heating, electric lighting. Factory machinery will be required.

Addition to factory for Cossitt Company. Masonry contract, Pattison & Fox, Brockville; carpentry, Brown & Co., Brockville; two storeys, 40x50, brick, exhaust-steam heating, electric lighting, composition roofing, one freight elevator. Factory machinery required.

TENDERS.

Prince Rupert, B.C.—Tenders are called for supply of about 1,800 tons of C. I. pipe, 6 in. to 18 in. in dia.; 38 tons special castings, a quantity of gate valves, valve boxes and hydrants. Received until November 20 by City Clerk, E. A. Woods; City Engineer, W. M. Davis.

Berlin, Ont.—The County Council of Berlin and Waterloo will purchase $3,000 worth of road machinery shortly.

High River, Alta.—Plans are being prepared for water works and sewerage. Engineers, Chipman & Power, Mail Building, Toronto; 17 Canada Life Building, Winnipeg, and Dauphin, Man.

Ridgetown, Ont.—Tenders will be called shortly for a fire pump, gasoline engine and a producer gas engine in connection with the new waterworks system. Engineer, C. E. Farncombe, London.

TRADE NOTES.

The Canadian Buffalo Forge Co., Montreal, has recently shipped a number of large steel plate exhaust fans to various parts of Canada. Two of the largest of these were installed for the Saraguay Electric and Water Co., Bordeau, just outside of Montreal. They are 170 inches in diameter, and are to be used for induced draft for 3,000 boiler horse power. Either fan alone has capacity to take care of the entire plant, leaving one in reserve. The fans are engine-driven with automatic speed regulator valves to keep the boiler pressure uniform by controlling the draft.

The Kelly Reamer Co., Cleveland, O., have recently opened offices at 96 Reade street, New York, 170 Oliver street, Boston, and 112 Queen Victoria street, London, England.

The Siemens Bros.' Dynamo Works have opened an office at 707 McArthur Block, Winnipeg.

Goold, Shapley, Muir, Brantford, Ont., will install water system for fire protection at the Jordan Sanitorium, River Glade, N.B. The system includes a 20,000 gallon tank erected on a 60-ft. steel tower and supplied with water from river by a hot air engine.

At a meeting of directors of the **B. Greening Wire Co., Ltd.,** held recently, Mr. H. B. Greening, who has been managing-director of the company for the last twelve months, was appointed president in place of his father, the late Mr. S. O. Greening. The board of directors is now composed of H. B. Greening, John Maw, N. S. Braden and R. H. Merriman. The officers of the company are: H. B. Greening, president and managing-director; R. H. Merriman, secretary; and F. J. Maw, superintendent. Mr. F. J. Maw is a son of John Maw who was superintendent from the incorporation of the company in 1889, until a few years ago when he retired from active management.

Port Colborne.—All signs point to exceptional industrial developments here next season. Negotiations are under way for securing the Union Furnace Co., Buffalo, to locate here. They manufacture car wheels, etc. The company is owned and operated by L. C. Hanna & Co., Cleveland, and Henry Yales, the Buffalo capitalist, is president. The company will employ two hundred men.

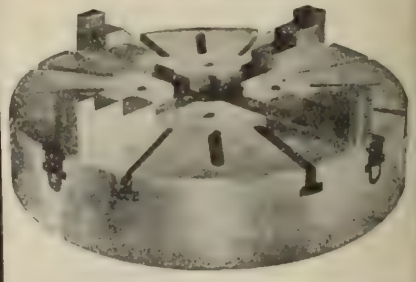
Doubling the size of the cement plant here will cost $700,000, and it will employ six hundred men.

The Robinson Bros. Cork Works are also making arrangements to greatly enlarge their

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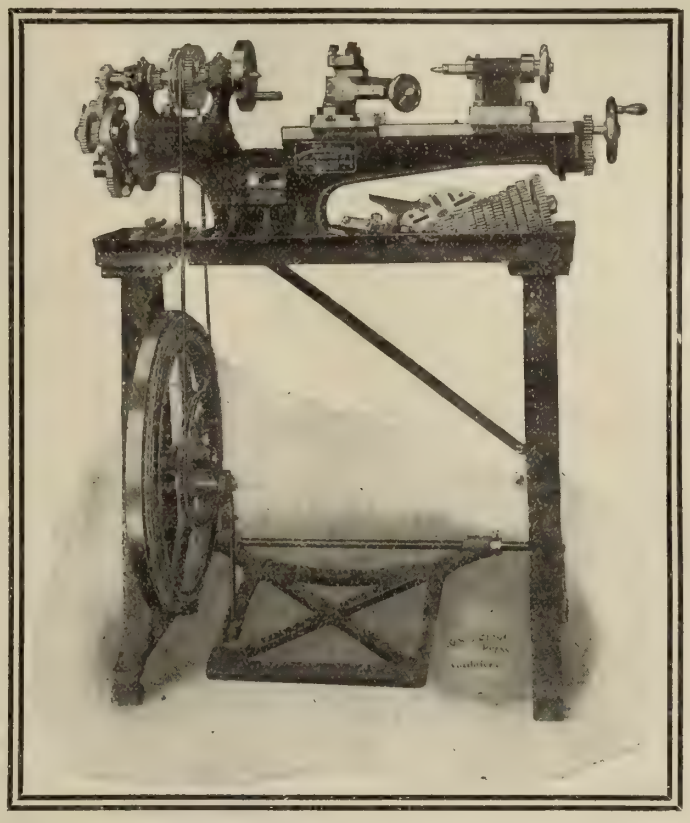
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For Model-Making, Motor Repairs and Small Manufactures. Self-Oiling, Sliding. Boring, Screw-Cutting. Back-Geared, Gap Bed, with Treadle or Countershaft.

Height of centres	3½ in.
Length of bed	2ft. 6 in.
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Diameter of gap	9½ in.
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PRICE
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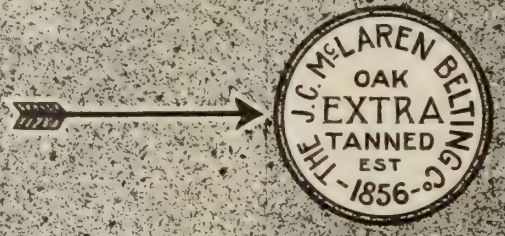
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ARE THE KIND YOU WANT.
More Likely to be Accurate.

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Makes Morrow make uniform.

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The JOHN MORROW SCREW, Limited, INGERSOLL

plant, and will double the number of their employees.

The Chamberlain Hooklam Switch Co. will open an office in Montreal shortly, for the purpose of administering their Canadian trade. Mr. S. L. B. Lines, a gentleman of wide experience in the firm's business, will be in charge. House or car meters and Venner automatic time switches, operated by 45-day winding clocks, which switch lights on or off in halls, streets, apartment houses as desired, are among the specialties to be handled by the Canadian house. This time switch has been approved by the British Board of Trade, and is equivalent to our Electrical Standards Laboratory. Their house meter is claimed to have a high ratio of torque to weight of moving element, thereby giving it a correspondingly high range of accuracy. A 220 volt meter will give accurate readings on 110 volts. Mr. Ernest E. Sharpe is now in Canada arranging preliminaries.

The Smart-Turner Machine Co., Hamilton, report the following orders recently received. Duplex plunger pump with pot valves, the International Harvester Co., Hamilton; centrifugal pump, the Zimmerman Mfg. Co., Hamilton; duplex pump, H. H. Weller, St. Catharines; centrifugal pump, the Colonial Wood Products Co., Thorold; duplex pump, the West Lorne Canning Co., West Lorne; triplex power pump, the Vineland Canning Co., Jordan, Ont.; two hydraulic pressure pumps, the Harris Abattoir Co., Toronto; duplex pump, the Beamsville Preserving Co., Beamsville; duplex pot valve pump, the Goldie & McCulloch Co., Galt; duplex pump, the John C. Mundell Co., Elora, Ont.; traveling cranes, the Ocean Falls Co., Vancouver, B.C.; independent jet condenser, Gunns Limited, Toronto.

The Kerr Engine Co., Walkerville, Ont, the well-known valve manufacturers, has commenced the manufacture in Canada of the "Simmons Patent Packless Valve," better known in the United States as the C. H. S. packless valve. It is claimed by the manufacturers to be perfectly packless, and an all-metal valve, there being no destructible composition rubber rings, or discs in the packless feature. The valve is substantial in construction, and one which will doubtless fill a long felt want in the heating trade, and especially on vacuum systems.

C. P. R. ANNUAL MEETING.

The feature of the recent annual meeting of the shareholders and directors of the Canadian Pacific Railway was the general tone of optimism visible in all the reports submitted, and a general provision all along the line for greater business and greater expansion during the coming year.

The executive as a whole was re-elected, and Sir William Van Horne, Messrs. H. S. Holt, E. B. Osler, R. B. Angus, whose terms as directors had expired, were again elected to their places on the board.

Sir Thomas Shaughnessy, on taking his place as president of the railway, was presented with the congratulations of the shareholders on the success of the railway during the past year.

Nothing was done in the appointment of a successor to Sir William White, although his appointment to the board of directors to take the place of the late Robert Meighen was approved.

It is reported, however, that Mr. Bury, the general manager of the western lines, was appointed at the meeting of the board of directors, which was private.

The western shops of the railway, Sir Thomas Shaughnessy announced, would be erected at Calgary if satisfactory arrangements could be made with the city authorities.

A policy of great expansion in the direction of steamship transportation was provided for by the authorizing of the issuance of $800,000 worth of 4 per cent. debentures for the steamship account.

Authority was also given for the issuing of a large debenture to an amount not mentioned for the branch line account.

JOHN H. HALL & SONS, BRANTFORD.

In view of the increased demand for pipe-threading machines and grey iron castings, John H. Hall & Sons have acquired an interest in the Brantford Foundry, better known as the Burrill Foundry Co. The new concern will be known as the John H. Hall & Sons Foundry Co. George E. Forsythe and Norman J. Prowse, the former proprietors of the foundry, retain an interest. The new concern is well equipped to handle not only large quantities of work, but the most intricate and difficult castings in grey iron, brass and aluminum. It is the intention to cater to the growing demand for jobbing castings, as well as surplus work from large factories, which, with the regular line of work and contracts on hand, will necessitate the employing of 25 men in the new foundry.

The present factory of John H. Hall & Sons, on Bridge Street, is also undergoing many changes and extensions, they having already let the contract for an enlargement which will nearly double their capacity. All the adjacent land obtainable has been purchased, and building operations are now under way. The new addition will be used for erecting purposes only; a traveling crane of latest design will be installed, to give every convenience for the handling of heavy work. Each department is under the personal direction of one of the firm, which consists of Mr. Hall, Sr., and four sons. By giving attention to all details, they have built for themselves such a reputation that now, with the most improved equipment, blacksmith shop, draughting room, pattern shop, foundry and machine shop, they are unable to meet the demands for their products, hence this latest extension.

The firm has been manufacturing a full line of pipe-threading machinery and have placed machines in all the tube mills in Canada, as well as some of the largest plumbing and steamfitting companies. Arrangements have also been made with an American concern to build and operate electric welding machines, the exclusive Canadian agency for same having been secured.

LINDE CANADIAN REFRIGERATION CO., LTD.

Mr. C. W. Vollmann, who for the past fifteen years has been carrying on business in Canada under the firm name of "The Linde British Refrigeration Company, Limited, of Canada," is continuing the same business under the style of The Linde Canadian Refrigeration Company, Limited, with offices at 37 St. Peter Street, Montreal. Sixteen years ago Mr. Vollmann made an arrangement with the Linde British Company by which he was to have the exclusive right to manufacture "Linde" machines in the Dominion for a stated period. This agreement expired last February. The British Company then decided to send a representative to Canada to look after their interests and Mr. Vollmann changed the style of his firm name to prevent confusion. Mr. Vollmann is the president of the Linde Canadian Refrigeration Company, Limited, which is financed by Canadian capital and managed by a Canadian board. This firm will continue to sell and instal the Linde type of refrigeration plant.

CHANGE OF FIRM NAME.

The Canada Wire Goods Mfg. Co. announces a slight change in the firm name, which hereafter will be known as **Canada Wire and Iron Goods Co.** The change is simply for the purpose of better designating their lines of manufacture, and incidentally to break the similarity of their name with other manufacturers in Hamilton. There has been no change in the management which consists of Wm. Holmes and Alexander Donald, both of whom have been long and favorably connected with the Wire Industry. The principal lines manufactured by this company are Double Crimped Wire Cloth of all grades, Coal and Ore Screening, Perforated Metals, Metal Clothes Lockers, Ornamental Wire & Wrot Iron Office and Bank Railing, Grilles in all finishes and General Wire Work. The plant of the **Canada Wire and Iron Goods Co.** has been enlarged during the present year by fully one-half of its former capacity, resulting in a greatly increased output. The Company is about to issue a new general catalogue which a post card will bring. The Company's agents are: R. A. Ogilvie, P.O. Box, 856, Vancouver, B.C.; J. S. Parkes, 446 St. Paul St., Montreal, Que.; D. Phillip, 291½ Portage Ave., Winnipeg, Man.

THE NOVA SCOTIA CAR WORKS.

Halifax, N.S.—The directors of the Nova Scotia Car Works made an inspection of the plant recently. There were present: O. E. Smith, president; J. W. Allison, F. B. McCurdy, M.P.; S. M. Brookfield, F. Stanfield, M.P.; A. M. Bell, of Halifax, and Hon. J. R. Lamy and J. R. Douglas, of Amherst. The directors were accompanied by F. M. Brown, vice-president and general manager, and C. F. Rydeberg, superintendent. J. R. Macleod also was present.

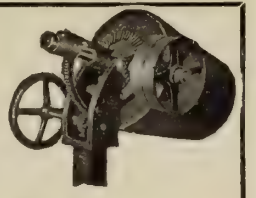
The new office building, the upper floor of which will be used by the drafting department, was first visited. Then a tour was made of the power house, the car mill, the forge shop, the machine shop, the foundry and the erecting shed. The piers for the steel underframe building, which will be in operation in December, were inspected.

A new air compressor has been added to the power department and throughout the plant there have been large additions to the mechanical equipment. It is now turning out an average of twelve cars daily, and over 500 men, well organized to accomplish the best results, and equipped with the latest labor-saving devices, are employed. The output of box cars will be still further increased and

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in a Globe improved Tilting Tumbler and get finest results, quickest and cheapest. It is made in six sizes for all purposes for wet or dry work.



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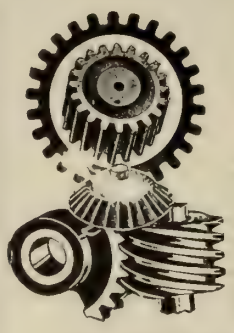
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All weights up to 6,000 lbs.
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GALT FOUNDRY CO, GALT, ONT.

the plant for making steel underframe cars will add yet more to the output. The directors expressed satisfaction with their inspection.

CANADIAN CAR & FOUNDRY CO.

The Canadian Car & Foundry Co., of which N. Curry is president, have some important building operations in hand with the object of increasing their capacity. At Turcot, near Montreal, their facilities for constructing passenger cars will be doubled, which will enable them to turn out 12o cars per annum. They have just completed a steel car plant for building steel under-frames and composite cars. The shops at "Dominion," just outside Montreal, are also being extended, to the extent of 50 per cent.; at this place "all steel" cars are constructed.

The Canadian Steel Foundries, an allied concern, are erecting a plant at Longue Pointe, at a cost of about a million dollars, which will be ready at the beginning of the year. The Dominion Bridge Co. are furnishing the steel work; C. E. Deakin is doing the balance of work on the main building; and the Bishop Construction Co. and C. E. Deakin have some work on minor buildings.

The buildings, etc., cover 35 acres, at Longue Pointe, and the company will have a capacity of 25,000 tons of steel castings per annum; this includes manganese steel, switch work, and othfer material used in street and steam railway construction.

CATALOGUES.

"Storage Battery Cars" is the title of Bulletin No. 13, just issued by the Gould Storage Battery Co., 341 Fifth Ave., New York. This bulletin explains the economics of the storage battery car, describes the standard type made by the Gould Co., and cites the conditions under which storage battery cars can be used most profitably. A copy will be sent on request.

Bulletin No. 36 of the Bates Machine Co., Joliet, Ills., describes and illustrates the new Bates Inertia Valve Gear, which is now regularly applied to all Bates Corliss Engines. This new gear has attracted much attention because of its positiveness and quiet operation, and the absence of hooks, springs and rollers.

"Something out of the Commonplace," in catalog form 15, just off the press, gotten out by the Hess Flume Company of 635-636 First National Bank Building, Denver, Colorado, and showing their metal flumes as used for irrigation, power, mining and substructures for various purposes. This interesting booklet is printed in what our printer friends call "reverse," that is, the type and the pen drawing illustrations are in white, and the paper a dark blue, imitative of the blue-prints with which we are all so familiar. This catalogue is unique and interesting, for it contains much information on the subject of flumes in general, of real value. Two pages are devoted entirely to tables of the carrying capacity of different sized flumes and various specifications. These should be helpful to the engineer or in fact to anyone figuring an such work.

The Hess Co. claim two advantages for their improved galvanized toncan metal flumes. First, the fact that they are made of toncau metal sheets, supplied by the Stark Rolling Mill Co., Canton, O., and which are claimed to be particularly adaptable to meet the severest conditions and exposure. Second, they claim that the Hess is the only flume with a perfectly smooth interior. The interlocking sections are easily assembled, and a watertight joint is secured without the use of either solder or rivets. This joint offers absolutely no obstruction to the flow of water. The catalogue illustrates this joint, and the pen pictures show in detail the construction of the Hess flume. At the bottom of each page are different little pert reminders, in bold handwriting, that the Hess flume is made of rust-resisting toncan metal sheets. The other lines, metal lumber substructures, metallic intakes and outlets, headgates, pressure pipe are each briefly mentioned and described. Judging from both the standpoint of originality and from that of practical utility, the Hess flume catalogue is a most unique and interesting book, well worth the perusal of everyone interested.

We have received from **Gould and Eberhardt, Newark, N.J.**, a handy little scale showing suitable speeds for milling cutters, both carbon steel and high speed. On the other side of the card are given proportions of gear teeth from 1 to 16 diametral pitch. The card is enclosed in a neat celluloid case, having slots cut in it, so that only one line of figures is read at a time, thus saving one much trouble in picking out the information desired. Gould and Eberhardt are the well known builders of automatic gear-cutting machinery and high duty shapers.

John Acton, 118 John St., Brooklyn, N.Y., has forwarded us a copy of his newly-issued catalogue of modern automatic steam, water, air and vacuum specialties. These include reducing valves for both high and low pressure service, pump regulating valves, relief valves, etc., etc.

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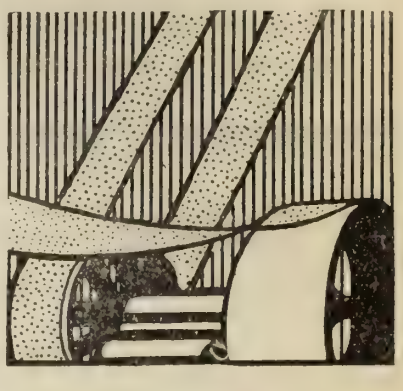
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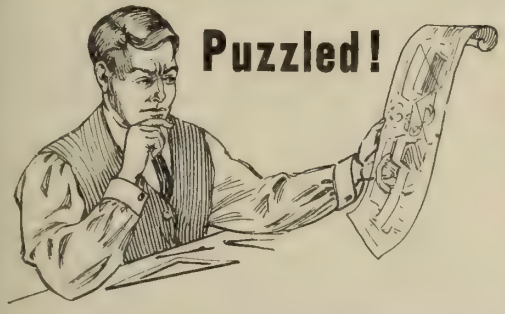
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Toronto, Ont.

We have received from the **McGraw-Hill Book Co., New York**, their latest list of books dealing with electrical engineering. Books on all branches are listed, and those interested would be well advised to secure a copy.

The Patterson-Allen Engineering Co., Jersey City, N.J., have favored us with a bulletin describing their machine for uniting flanges with wrought iron or steel pipe by hydraulic pressure. This process is capable of putting flanges on pipes of any diameter from 2 to 20 inches, and of any thickness, at insignificant cost. The machine operates automatically, no skilled labor being required.

The Stevens Co., of Galt, Ont., send us a little booklet setting forth the advantages of the Gronkvist chuck for straight shank drills. In this chuck the shank is gripped by three hardened steel rollers bearing upon hardened eccentric curves, so that the greater the strain the tighter the drill is held.

The Cincinnati Pulley Machinery Co., Cincinnati, Ohio, have favored us with a set of bulletins descriptive of their various machines for boring, turning and tapping cast iron pulleys. They also make the Avey sensitive drill press. This is a high speed, ball bearing press, built with from two to six spindles, and has a capacity up to ⅞-inch drills.

The Union Twist Drill Co., Athol, Mass., have favored us with a copy of their new Catalog F, which lists gear cutters, milling cutters, twist drills, sockets, etc., for which the firm enjoys a wide reputation. The catalogue is attractively got up and is of convenient size for reference.

The Canada Wire and Iron Goods Co., Hamilton, Ont., have issued their Catalogue No. 3 which gives full particulars of their line of manufactures in wire cloth and perforated sheet metal. These are too numerous to refer to, more particularly as the firm's motto "If it's made of wire, we make it," sufficiently proves.

BOOK REVIEWS.

Vol. X, the tenth annual edition of the Copper Handbook, is just received. The new issue of this work, which is considered a standard authority on the subject of copper and copper mines for the entire globe, has 1,902 octavo pages, containing nearly 1,500,000 words, and, in addition to the miscellaneous chapters, lists and describes 8,130 copper mines and copper mining companies, in all parts of the world, this being the largest number of titles ever listed by any work on mining. The descriptions range from two or three lines, in the case of dead companies, wherein reference is made to detailed descriptions in past volumes at the period of their activity, up to twenty-one pages in the case of the Anaconda mine, which yields one-eighth of all the copper made in the world.

The miscellaneous chapters of the book, twenty-four in number, treat the subject of copper from all possible viewpoints, there being chapters on the history, chemistry, mineralogy, metallurgy, brands and grades, alloys and substitutes of copper, with a copious glossary, and a chapter of statistics ending the book that contains 40-odd tables, thoroughly covering copper production, consumption, movements, prices, dividends, etc. The Copper Handbook is sold on the unique plan adopted nine years ago, the publisher sending the book by mail, prepaid, to any address ordered, without advance payment of any sort, and subject to return after a week's inspection. The price is $5 in a strong green buckram binding with silk headband and gilt top, or $7.50 in full library morocco. Anyone interested in copper, as a producer, consumer or investor in shares, would do well to write the author and publisher, Mr. Horace J. Stevens, Houghton, Michigan, ordering a copy of the new Copper Handbook sent prepaid, subject to approval.

The Westinghouse Electric and Manufacturing Co. have just issued the first edition of an attractive monthly publication entitled "Small Motors," which is devoted to forming a co-operative bond between the manufacturer and the dealer in small electric motors for general household, store and office work. The contents are devoted to practical applications of small motors, showing views of them in such actual service as operating ice cream freezers, small lathes, washing machines, grinding wheels and numerous household devices.

An interesting application of the small motor for the household is its use as an auxiliary to the furnace, assisting the heating and ventilating of same, by means of a blower attachment. Advice as to installation, operation and care of motors is given in short, practical talks.

"Pointers for Inventors" and **"Pointers for Patentees"** are the titles of two little booklets by Egerton R. Chase, Patent Attorney, Temple Building, Toronto, at a price of 25 cents each. The first book deals with methods whereby inventors secure capital to patent their inventions, and the second with methods whereby patentees are successful in selling their patents or manufacturing rights thereunder. We can confidently recommend these little books to the attention of all inventors.



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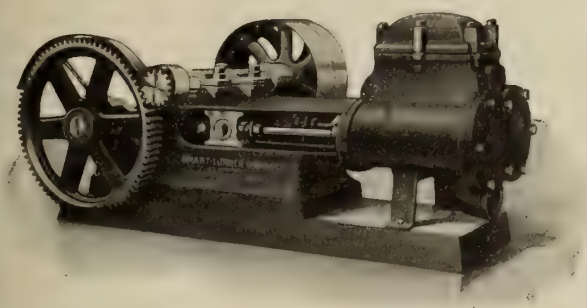
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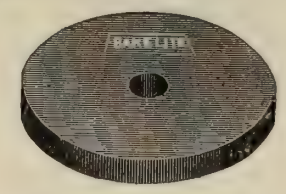
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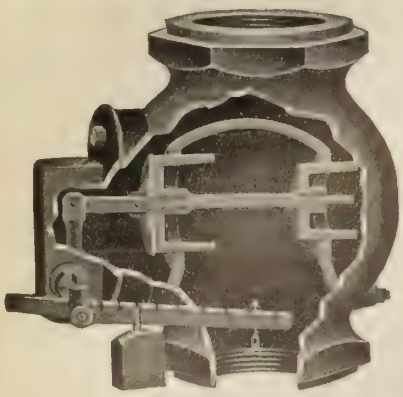
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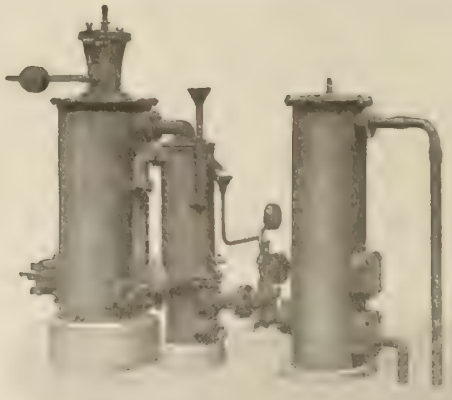
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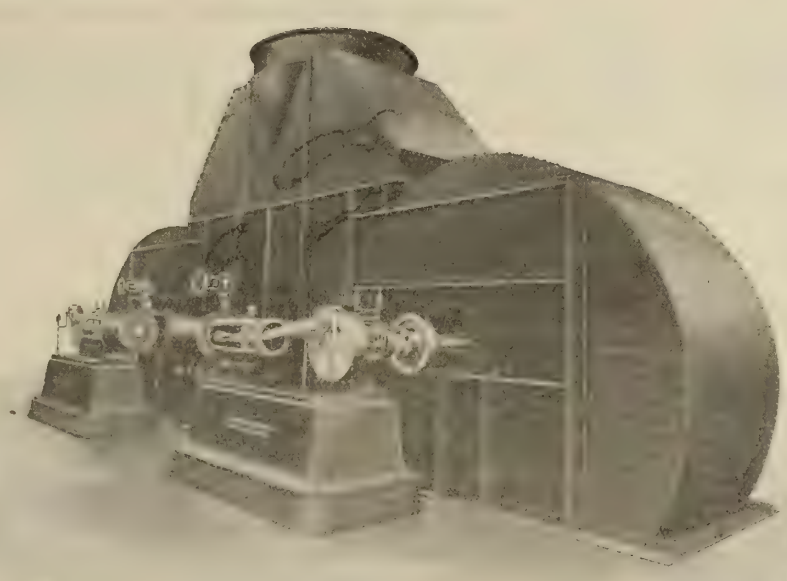


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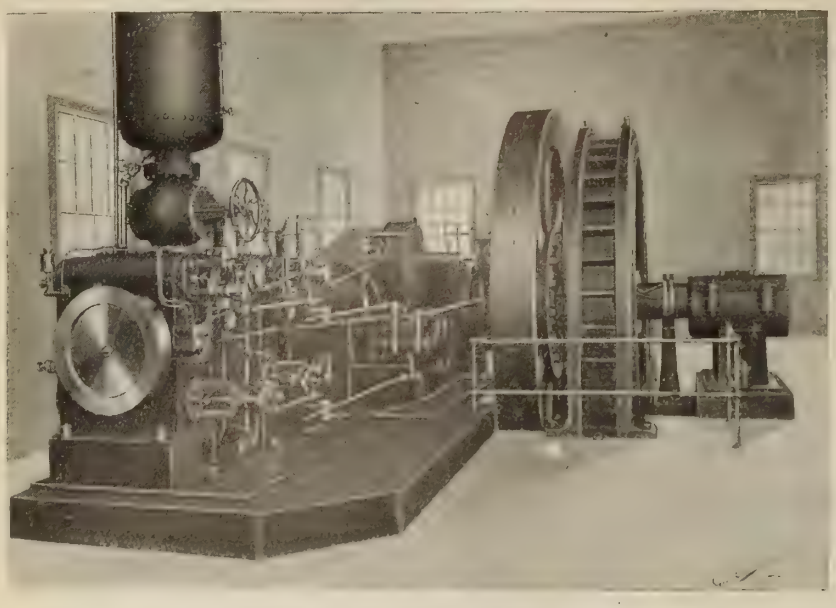


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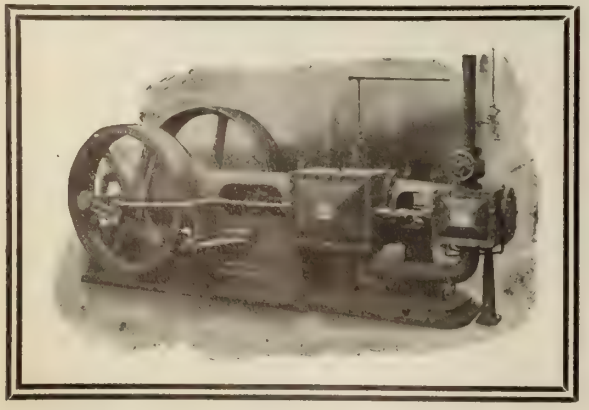
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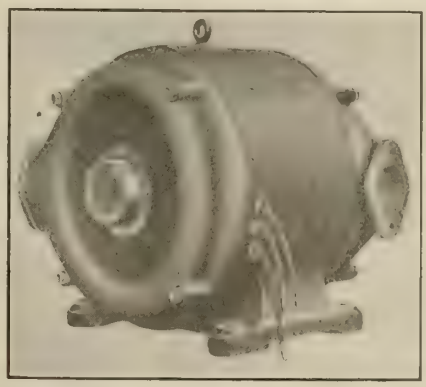
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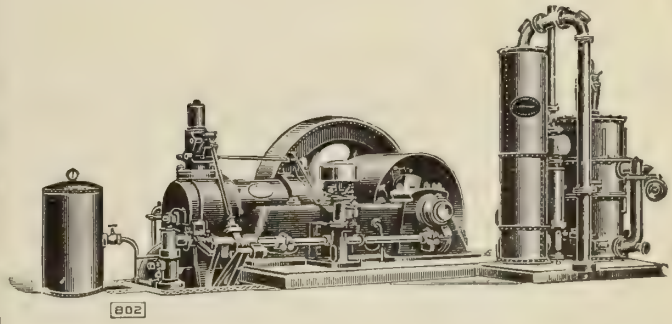
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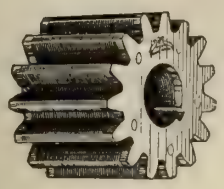
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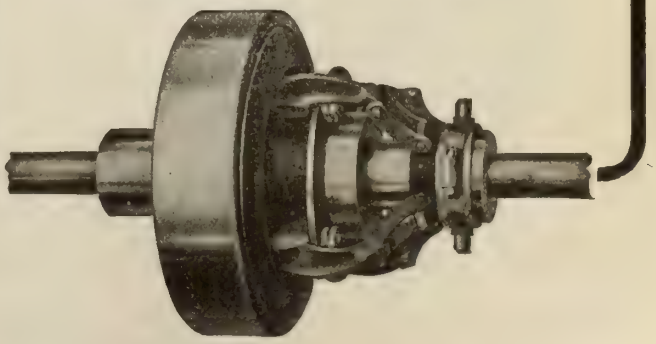
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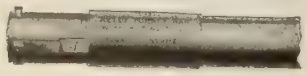
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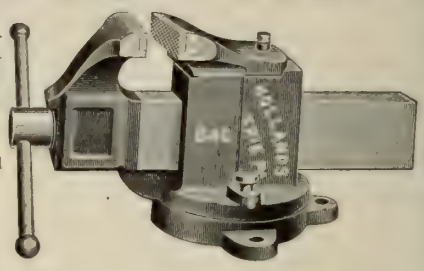
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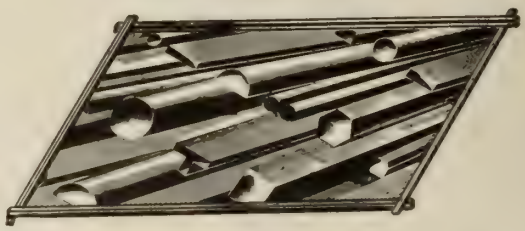


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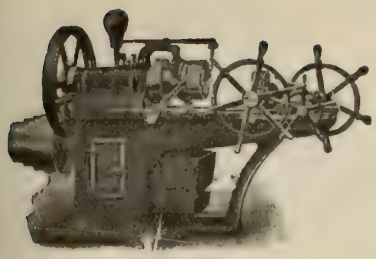
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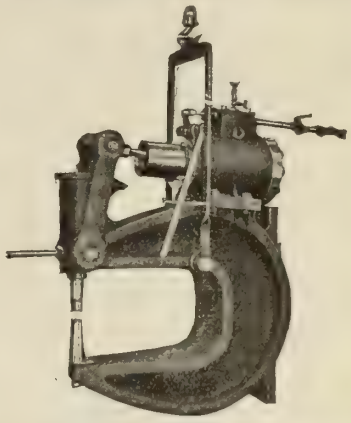
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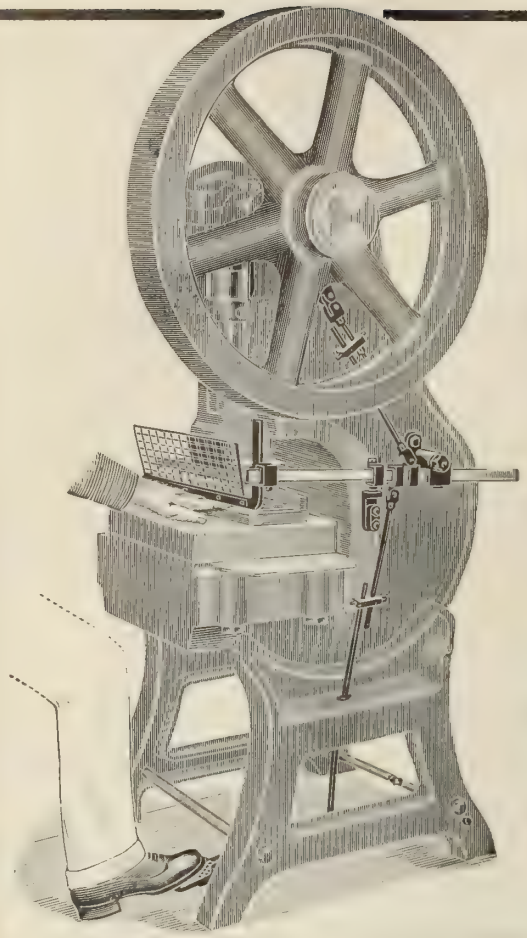
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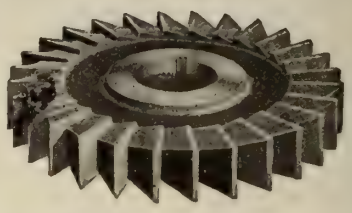
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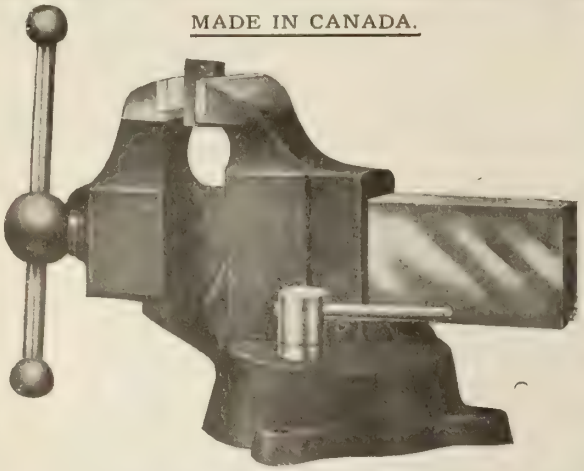
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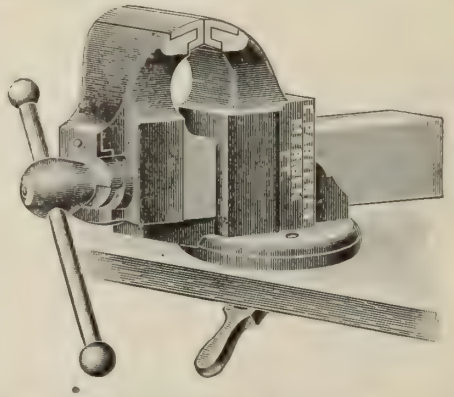
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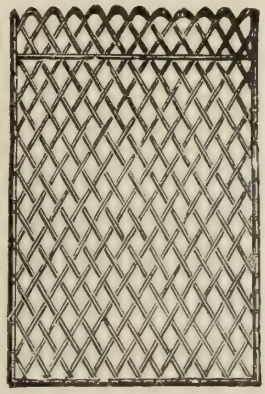
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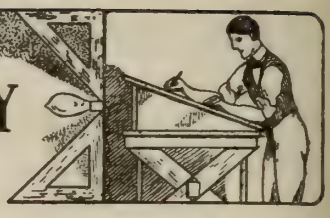
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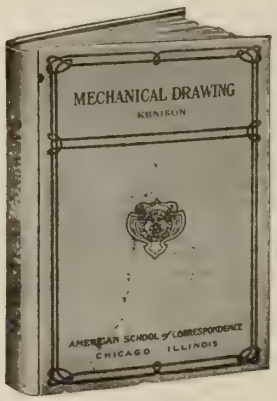
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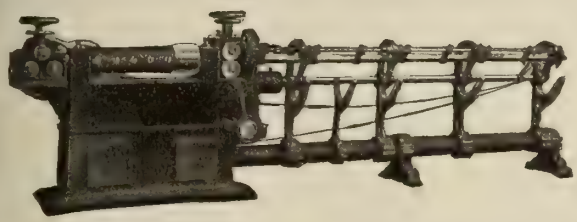
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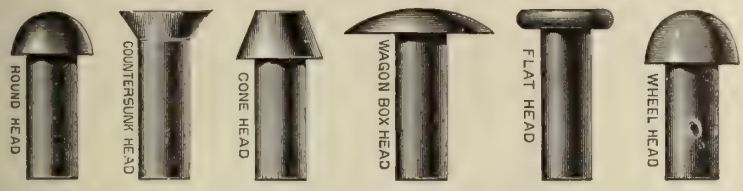
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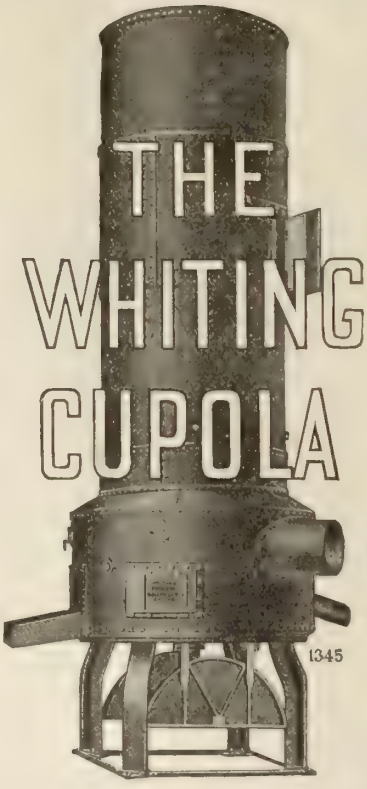
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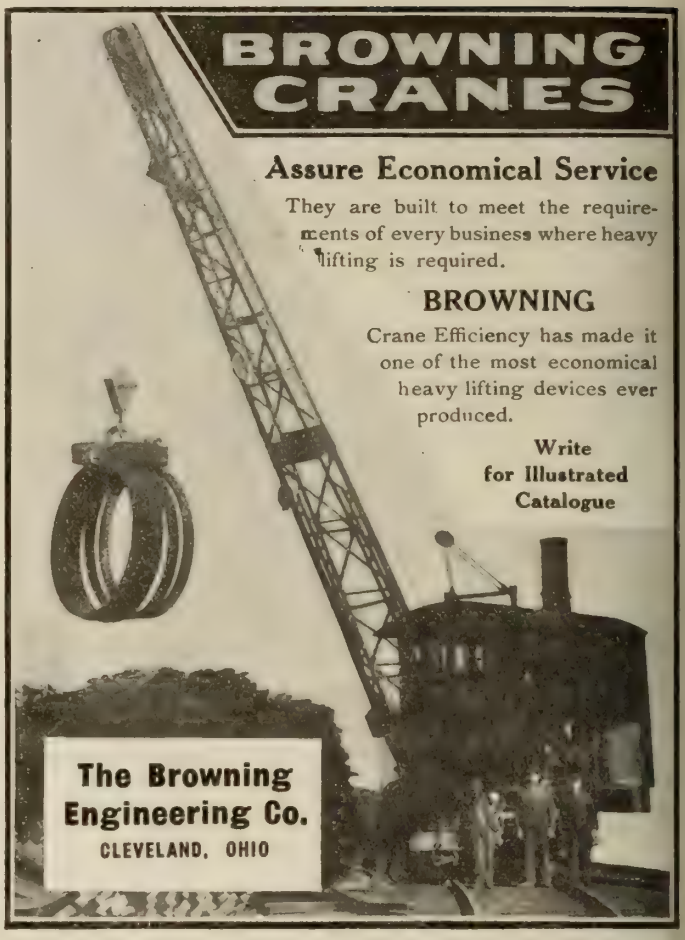
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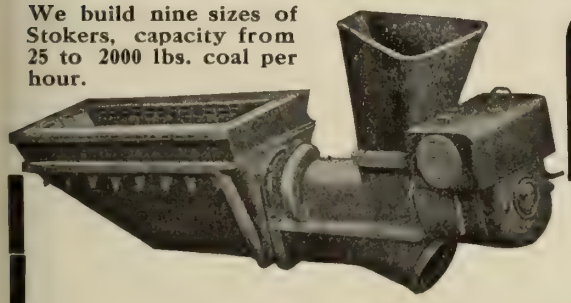
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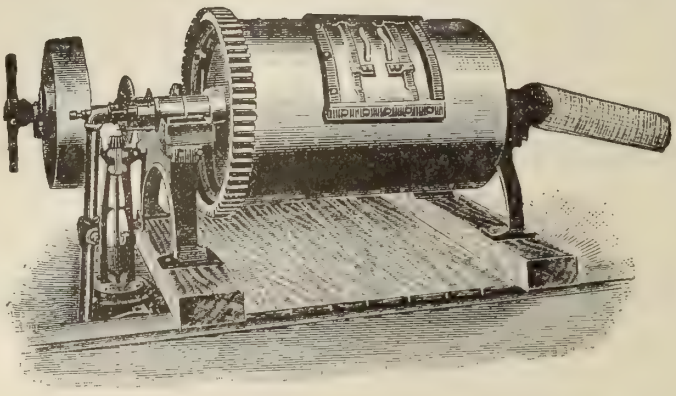
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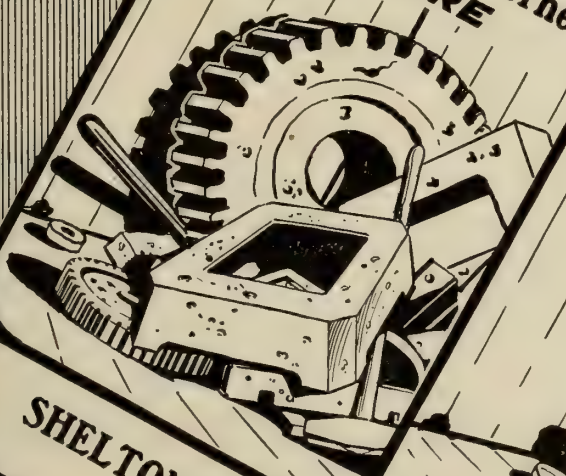
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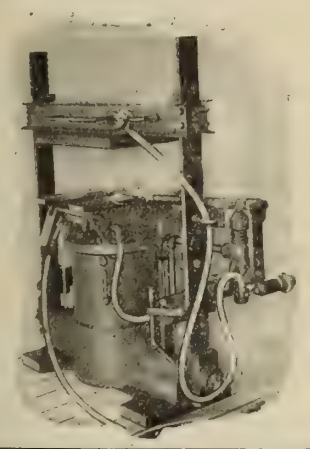
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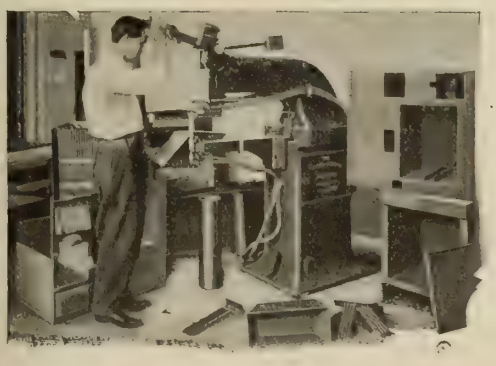
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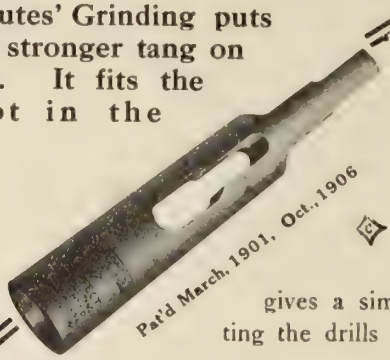
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Joshua Heap & Co., Ltd., Ashton-under-Lyne, Eng.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Machinery Co., Tiffin, Ohio
National Mach. & Supply Co, Hamilton
Niles-Bement-Pond Co., New York.

Boring Machines, Upright.
John Bertram & Sons Co., Dundas, Ont.
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York
Springfield Machine Tool Co., Springfield, O.

Boring Machines, Pneumatic.
The Canadian Fairbanks Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
General Supply Co. of Canada, Ottawa
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.

Boring and Turning Mills.
John Bertram & Sons Co., Dundas, Ont.
Bullard Machine Tool Co., Bridgeport, Conn
Foss & Hill Machinery Co., Montreal.
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton.
Mussens Limited Montreal.
National Mach & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co, Cleveland.
Francis Hyde & Co., Montreal.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland
Francis Hyde & Co., Montreal.

Brake Shoes.
Canadian Steel Foundries, Montreal

Brass Working Machinery.
Gardner Robt., & Son Montreal
General Supply Co. of Canada, Ottawa
Mussens Limited Montreal.
National Mach. & Supply Co., Hamilton
Warner & Swasey Co., Cleveland, Ohio.

Brazing Compounds.
Phillips-Laffitte Co., Philadelphia

Buckets, Clam Shell & Grab.
Browning Engineering Co., Cleveland, O.
Whiting Foundry Equipment Company, Harvey, Ill.

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Foss & Hill Machinery Co., Montreal
London Mach. Tool Co., Hamilton, Ont
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Burners, Fuel Oil and Natural Gas.
Rupert G. Bruce Co., Ltd., Toronto
Francis Hyde & Co. Montreal.
W. S. Rockwell Co., New York
Whiting Foundry Equipment Co., Harvey, Ill.

Burrs, Iron and Copper.
Parmenter & Bullock Co, Gananoque

Calipers.
Schuchardt & Schutte, New York

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y
National Mach. & Supply Co., Hamilton

Capstans
Royce, Ltd., Toronto.

Car Replacers.
Canadian Steel Foundries, Montreal
Montreal Steel Works. Montreal
Mussens, Limited, Montreal

Car Wheels, Mine.
Canadian Steel Foundries, Montreal

Cars, Industrial.
Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Francis Hyde & Co., Montreal.
Mussens Limited Montreal.
Sheldons, Limited, Galt
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Lumen Bearing Co., Toronto
Tallman Brass & Metal Co., Hamilton

Castings, Brass.
Hall Engineering Works, Montreal.
Lumen Bearing Co., Toronto
Owen Sound Iron Works Co., Owen Sound.
Tallman Brass & Metal Co., Hamilton
Waterous Engine Works Co. Brantford

Castings, Grey Iron.
Gardner, Robt. & Son, Montreal
Hall Engineering Works, Montreal.
Owen Sound Iron Works Co., Owen Sound
Springfield Machine Tool Co., Springfield, O.
Waterous Engine Works Co, Brantford

Castings, Steel and Manganese Steel.
Canadian Steel Foundries, Montreal

Castings, Malleable.
Galt Malleable Iron Co., Galt
Pratt & Letchworth, Brantford
Smiths Falls Malleable Castings Co., Smiths Falls

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Cement, Iron.
Shelton Metallic Filler Co., Derby, Conn

Cement Machinery.
The Canadian Fairbanks Co., Montreal
Gardner Robt. & Son. Montreal
National Mach. & Supply Co, Hamilton
Owen Sound Iron Works Co., Owen Sound.
Waterous Engine Works Co., Brantford

Centering Machines.
John Bertram & Sons Co., Dundas, Ont
Foss & Hill Machinery Co., Montreal
Gardner Robt. & Son, Montreal
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton, Ont.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
Pratt & Whitney Co, Hartford, Conn.
Waterous Engine Works Co, Brantford.

Chain Blocks.
Rupert G. Bruce Co., Ltd., Toronto
The Canadian Fairbanks Co., Montreal
Ford Chain Block Co., Philadelphia, Pa.
General Supply Co. of Canada Ottawa
John Millen & Son, Montreal
Mussens Limited, Montreal.
National Mach. & Supply Co. Hamilton
Schuchardt & Schutte, New York

Chucks, Drill, Lathe and Universal.
John Bertram & Sons Co., Dundas, Ont
Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn
Foss & Hill Machinery Co., Montreal
Gardner Robt. & Son, Montreal
General Supply Co of Canada, Ottawa
S. E. Horton Machine Co., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Schuchardt & Schutte, New York
Standard Tool Co., Cleveland, O
Union Mfg. Co., New Britain, Conn.

Chucking Machines.
The Garvin Machine Co., New York
Niles-Bement-Pond Co., New York.
Springfield Machine Tool Co, Springfield, O.
Warner & Swasey Co, Cleveland, Ohio

Circuit Breakers.
Canadian Westinghouse Co., Hamilton.

Cloth and Wool Dryers.
Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Clutches.
Positive Clutch & Pulley Works, Toronto

Coal Boring and Cutting Machines.
Canadian Rand Co., Montreal

Coal Handling Machinery.
Browning Engineering Co., Cleveland, O.
Standard Engineering Co., Toronto.
Waterous Engine Works Co., Brantford

Collectors, Pneumatic.
Can. Buffalo Forge Co., Montreal
Sheldons Limited, Galt

Collets, Milling Machine.
The National Tool Co., Cleveland, O.

Compressors, Air.
Canadian Rand Co,, Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
Mussens Limited, Montreal.
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton

Concentrating Plant.
Gardner, Robt. & Son, Montreal

Concrete Mixers.
The Canadian Fairbanks Co., Montreal
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Mussens, Limited, Montreal
National Mach & Supply Co., Hamilton

Concrete, Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton
B. Greening Wire Co, Hamilton
Steel and Radiation, Toronto

Condensers.
Goldie & McCulloch Co., Galt.
Hall Engineering Works Montreal.
The Smart-Turner Machine Co., Hamilton
Waterous Engine Co, Brantford.

Consulting Engineers.
Hall Engineering Works, Montreal.
Robertson, J. M., Ltd., Montreal
Standard Engineering Co., Toronto

Controllers and Starters Electric Motor.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.
The Canadian Fairbanks Co., Montreal
Canadian Matthews Gravity Carrier Co., Toronto
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt
Mussens Limited, Montreal.
National Mach. & Supply Co, Hamilton
The Smart-Turner Machine Co., Hamilton
Waterous Engine Works Co., Brantford.

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.

Counterbores and Countersinks.
Cleveland Twist Drill Co. Cleveland
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Morse Twist Drill and Machine Co., New Bedford
National Tool Co., Cleveland, O.
Standard Tool Co., Cleveland, O

Couplings.
Gardner Robt. & Son. Montreal
Noon Universal Coupler Co., Toronto
Owen Sound Iron Works Co, Owen Sound

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Canadian Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago

Cranes, Locomotive.
Browning Engineering Co., Cleveland, O
Mussens, Limited, Montreal

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Dominion Bridge Co., Montreal
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Mussens, Limited, Montreal
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Royce, Ltd., Toronto.
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Cranes, Wrecking.
Browning Engineering Co. Cleveland

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Garvin Machine Co., New York
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Modern Tool Co., Erie, Pa.
Mussens, Limited, Montreal

Cutters, Milling.
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Cleveland Twist Drill Co., Cleveland
Foss & Hill Machinery Co., Montreal
Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co. New Bedford
Mussens Limited, Montreal.
National Tool Co., Cleveland, O.
Pratt & Whitney Co. Hartford Conn.
Standard Tool Co., Cleveland O

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago
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Garvin Machine Co., New York
General Supply Co. of Canada Ottawa
Joshua Heap & Co., Ltd., Ashton-under-Lyne Eng.
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National Tool Co., Cleveland O.
Pratt & Whitney Co., Hartford, Conn.
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Standard Engineering Co., Toronto.

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Gardiner, Robt. & Son, Montreal
General Supply Co. of Canada, Ottawa
Holden-Morgan Co., Toronto
Jardine, A. B. & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford
Russell Machine Co., St. Catharines, Ont

Die Castings.
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Cincinnati Pulley Machinery Co., Cincinnati O.
Drummond Bros., Ryde's Hill, Eng.
Garvin Machine Co. New York
General Supply Co. of Canada, Ottawa
London Mach. Tool Co., Hamilton, Ont.
The Canadian Fairbanks Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Mussens Limited Montreal
Niles-Bement-Pond Co., New York

Drilling Machines, Radial and Turret.
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The Canadian Fairbanks Co. Montreal
Drummond Bros. Ryde's Hill, Eng.
Foss & Hill Machinery Co., Montreal
General Supply Co. of Canada, Ottawa
London Mach. Tool Co. Hamilton
Mueller Machine Tool Co., Cincinnati, O.
Mussens Limited Montreal
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Taylor & Fenn Co. Hartford, Conn

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W. F. & John Barnes Co. Rockford Ill.
H. G. Barr, Worcester, Mass.
Cincinnati Pulley Machinery Co., Cincinnati
Drummond Bros., Ryde's Hill, Eng.
General Supply Co. of Canada, Ottawa
D. McKenzie, Guelph, Ont.
Mussens, Limited, Montreal
Niles-Bement-Pond Co. New York
Taylor & Fenn Co., Hartford, Conn

Drilling Machines, Upright and Horizontal.
W. F. & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas, Ont.
W. P. Davis Machine Co. Rochester, N.Y.
Drummond Bros., Ryde's Hill, Eng.
Foss & Hill Machinery Co., Montreal
Gem Mfg. Co., Pittsburg, Pa.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co. Hamilton
Mussens Limited, Montreal
R. McDougall Co., Galt
Niles-Bement-Pond Co. New York
Springfield Machine Tool Co., Springfield, O.

Drills, Bench
W. F. & John Barnes Co., Rockford, Ill.
London Mach. Tool Co. Hamilton
Pratt & Whitney Co. Hartford, Conn.
United States Electrical Tool Co., Cincinnati

Drills, Blacksmith and Bit Stock.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co. Hespeler, Ont.
London Mach. Tool Co. Hamilton
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Centre.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill and Machine Co., New Bedford
Pratt & Whitney Co. Hartford, Conn.
Standard Tool Co., Cleveland, O
L. S. Starrett Co. Athol Mass.
Whitman & Barnes Mfg Co., St. Catharines, Ont

Drills, Coal and Plaster.
Canadian Rand Co., Montreal

Drills, Corner (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland

Drills, Electric and Portable.
General Supply Co. of Canada, Ottawa
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
United States Electrical Tool Co., Cincinnati

Drills, High Speed.
W. F. & John Barnes Co., Rockford, Ill.
Hermann Boker & Co., Montreal
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co, Cleveland
Morse Twist Drill and Machine Co., New Bedford
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn
Sibley Machine Tool Co., South Bend, Ind.
Standard Tool Co. Cleveland, O
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland
General Supply Co of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
Standard Tool Co., Cleveland, O

Drills, Pneumatic.
John F. Allen Co., New York
Canadian Rand Co., Montreal
Cleveland Pneumatic Tool Co., Cleveland
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co, Chicago.
The Canadian Fairbanks Co., Montreal
Cleveland Twist Drill Co. Cleveland
A. B. Jardine & Co., Hespeler
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Chas. Parker & Co., Meriden, Conn.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
Whitman & Barnes Mfg Co, St. Catharines, Ont

Drills, Rock.
Canadian Rand Co., Montreal.
Mussens, Limited, Montreal

Drills, Track.
Cleveland Twist Drill Co, Cleveland
General Supply Co. of Canada, Ottawa
Morse Twist Drill and Machine Co., New Bedford
Mussens, Limited, Montreal
Standard Tool Co., Cleveland O
Whitman & Barnes Mfg. Co., St. Catharines Ont

Drills, Twist.
The Canadian Fairbanks Co., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Morse Twist Drill and Machine Co. New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co. Cleveland O
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Morse Twist Drill and Machine Co., New Bedford
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General Supply Co. of Canada, Ottawa
Francis Hyde & Co. Montreal
Mussens Limited Montreal
National Mach. & Supply Co., Hamilton
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford

Dynamos and Electrical Supplies.
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Canadian Westinghouse Co., Hamilton
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Lancashire Dynamo and Motor Co., Ltd., Toronto
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Standard Welding Co., Cleveland, O.

Elevating Machinery
Canadian Matthews Gravity Carrier Co., Toronto

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Waterous Engine Work Co. Brantford.
Whiting Foundry Equipment Co., Harvey, Ill

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Cleveland Pneumatic Tool Co., Cleveland

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Garvin Machine Co., New York
Foss & Hill Machinery Co., Montreal
Francis Hyde & Co. Montreal
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Stevens F. B., Detroit Mich.

Emery Wheels, Dressers and Stands.
Rupert G. Bruce Co., Ltd., Toronto.
Canadian Hart Wheels Ltd., Hamilton.
Gardiner, Robt. & Son Montreal
Francis Hyde & Co., Montreal.
Mussens, Limited, Montreal
National Mach. & Supply Co., Hamilton

Engineers, Marine and Mechanical.
Canadian General & Shoe Machinery Co. Levis, Que

Engines, Marine.
The "Swift" Motor Car Co. of Canada Ltd, Chatham

Engineers' Supplies.
Hall Engineering Works. Montreal.

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The Canadian Fairbanks Co., Montreal
General Supply Co. of Canada, Ottawa
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco Montreal
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Engines, Steam.
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Waterous Engine Works Co., Brantford.

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Garvin Machine Co, New York

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The Canadian Fairbanks Co., Montreal
Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co, Toronto.

Exhausters
Can. Buffalo Forge Co., Montreal

Expanded Metal.
Steel & Radiation Ltd, Toronto

Experimental Work
Holden-Morgan Co., Toronto

Fans
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Canadian Westinghouse Co. Hamilton
Foss & Hill Machinery Co., Montreal
Sheldons Limited Galt, Ont.
The Smart-Turner Machine Co., Hamilton

Feed Water Heaters.
The Canadian Fairbanks Co., Montreal
Darling Bros., Montreal
General Supply Co. of Canada, Ottawa
Robb Engineering Co., Amherst N.S.
The Smart-Turner Machine Co., Hamilton
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Francis Hyde & Co., Montreal.
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Canadian Billings & Spencer, Ltd., Welland

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E. W. Bliss Co. Brooklyn, N.Y.

Forging Machinery.
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National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co, Toronto

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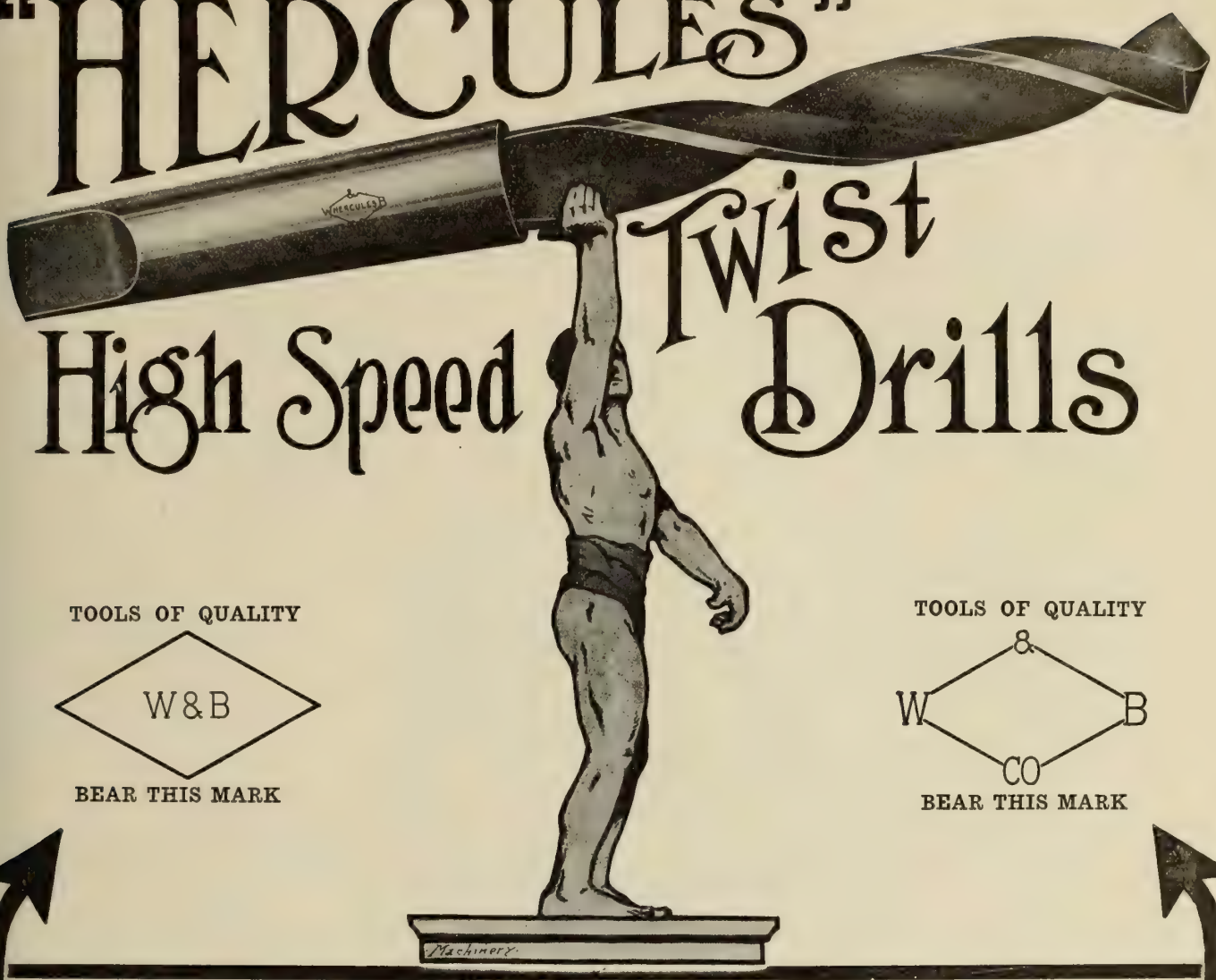
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Schuchardt & Schutte, New York

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Waterous Engine Works Co., Brantford

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United States Elec. Tool Co., Cincinnati
Morse Twist Drill and Machine Co., New Bedford

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Mussens, Limited, Montreal
Taylor & Fenn Co., Hartford, Conn
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Garvin Machine Co., New York
Mussens, Limited, Montreal

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Cleveland Pneumatic Tool Co., Cleveland

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General Supply Co. of Canada, Ottawa
Mussens, Limited, Montreal
United States Elec. Tool Co., Cincinnati

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Bath Grinder Co., Fitchburg, Mass.
Blount, J. G., & Co., Everett, Mass.

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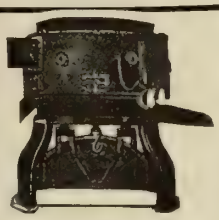
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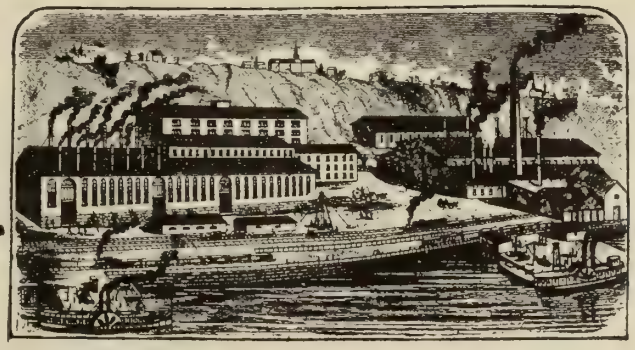


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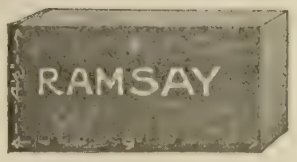
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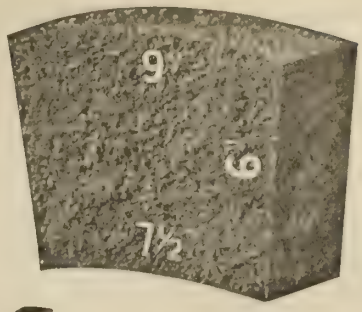


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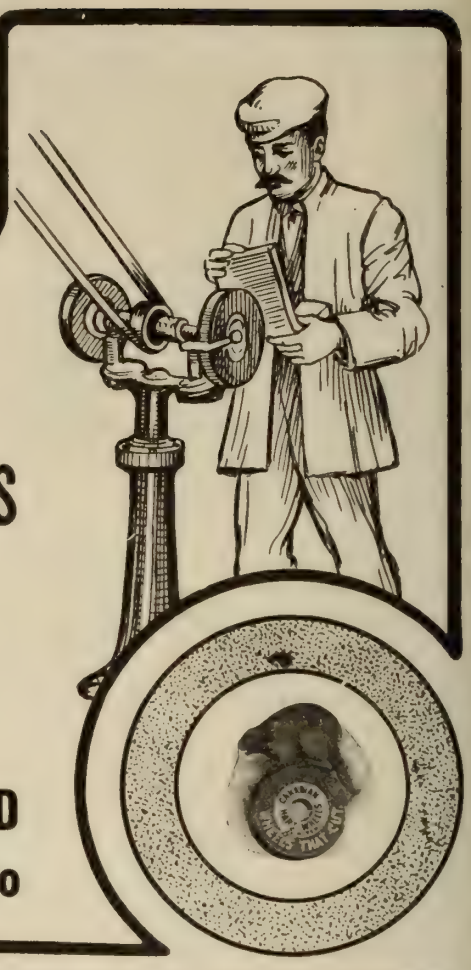
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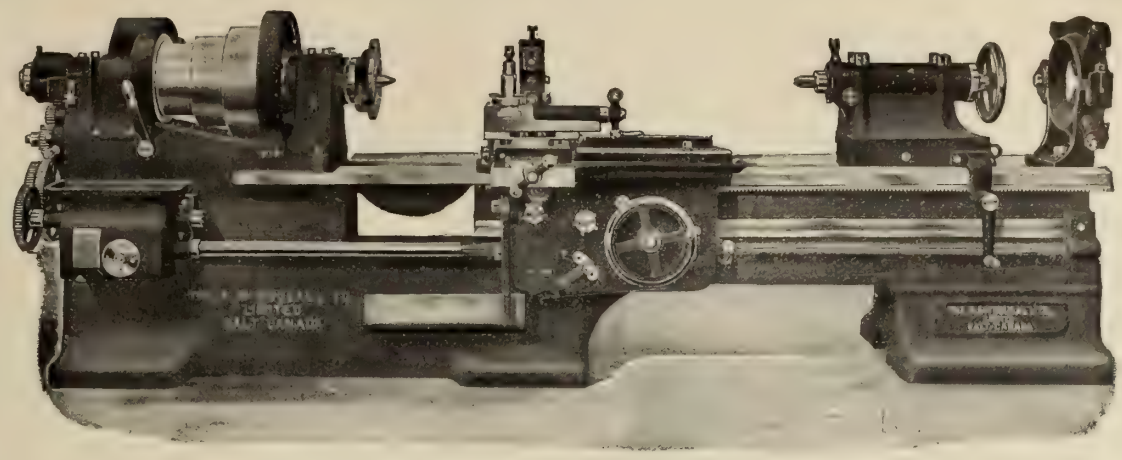
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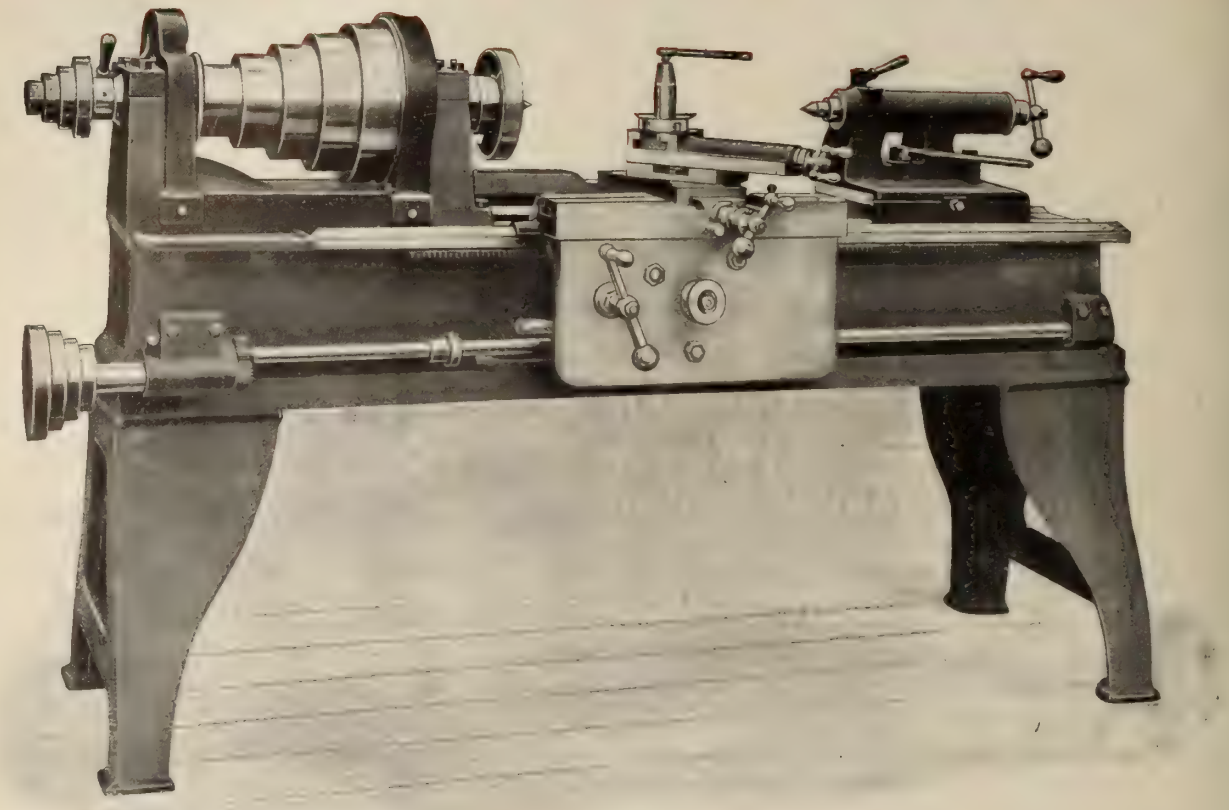
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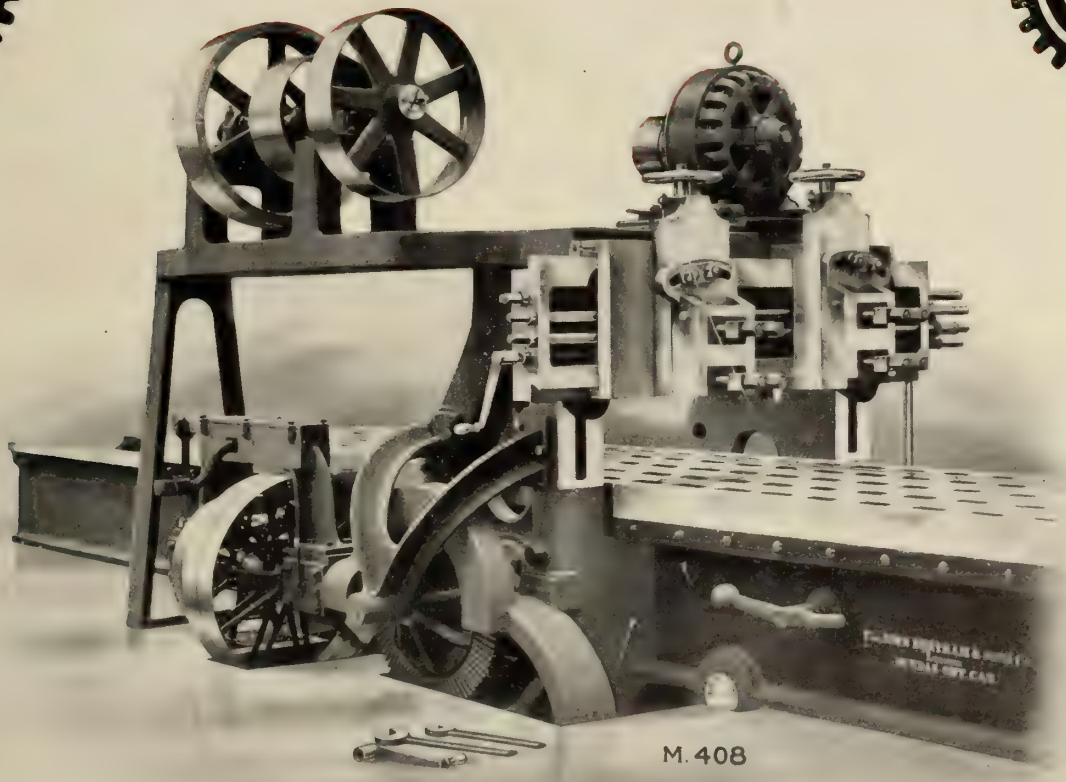
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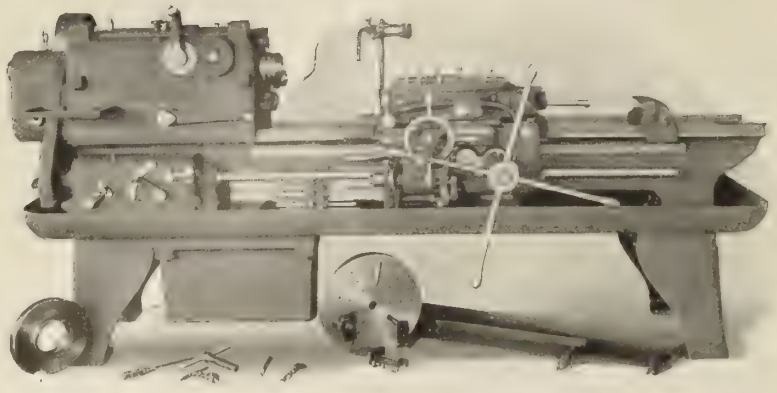
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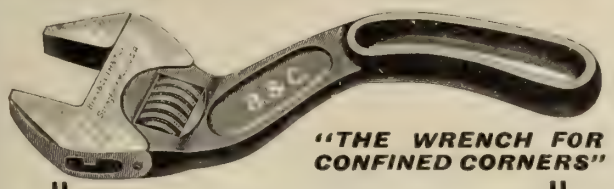
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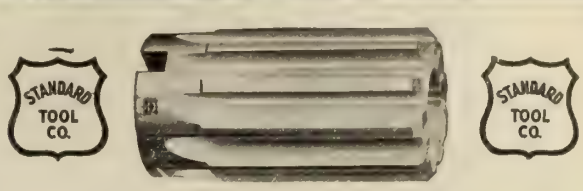
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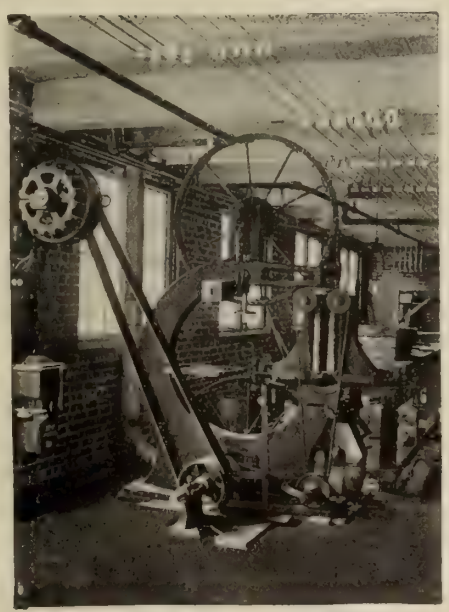
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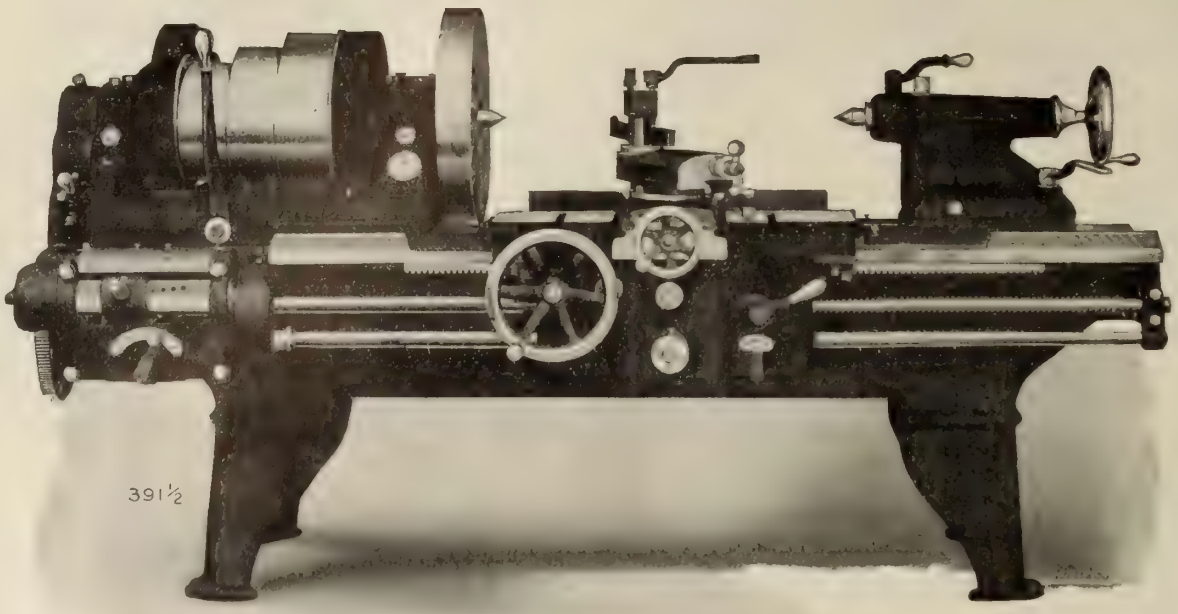
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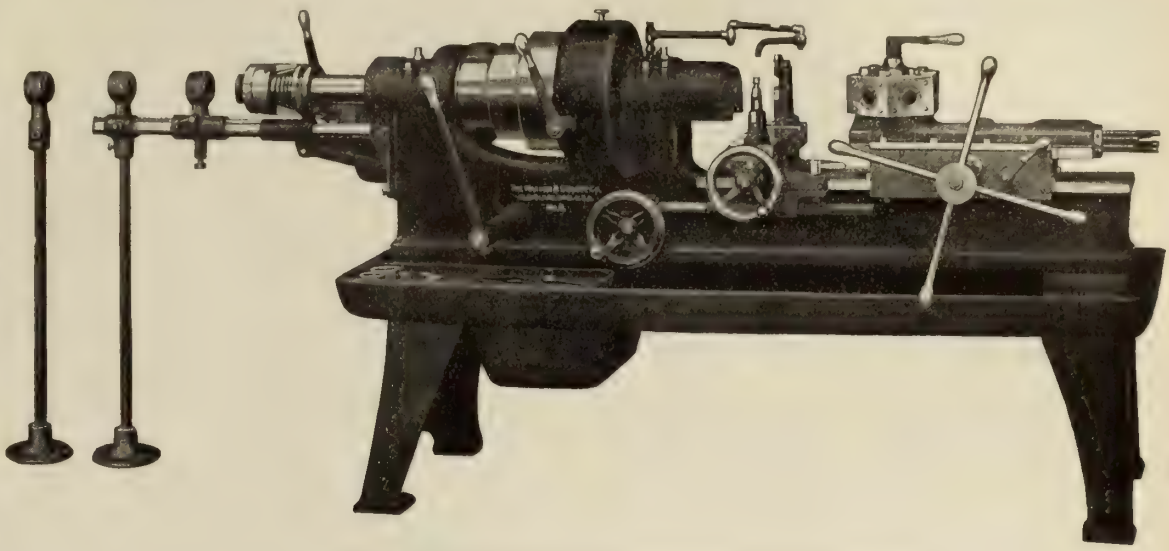
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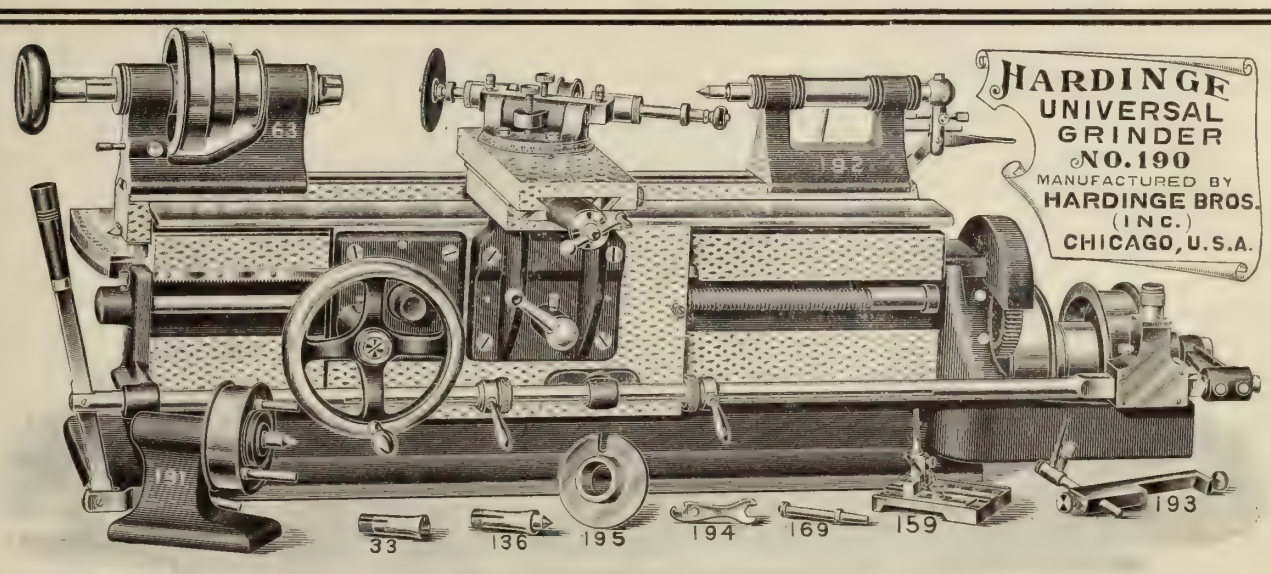


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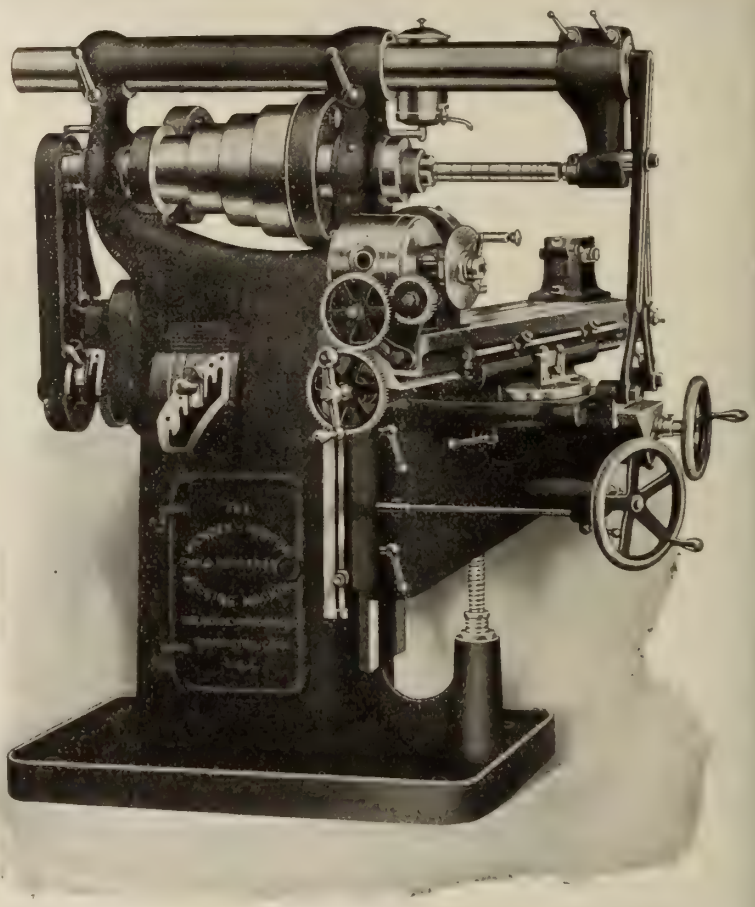
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HENDEY UNIVERSAL MILLING MACHINE

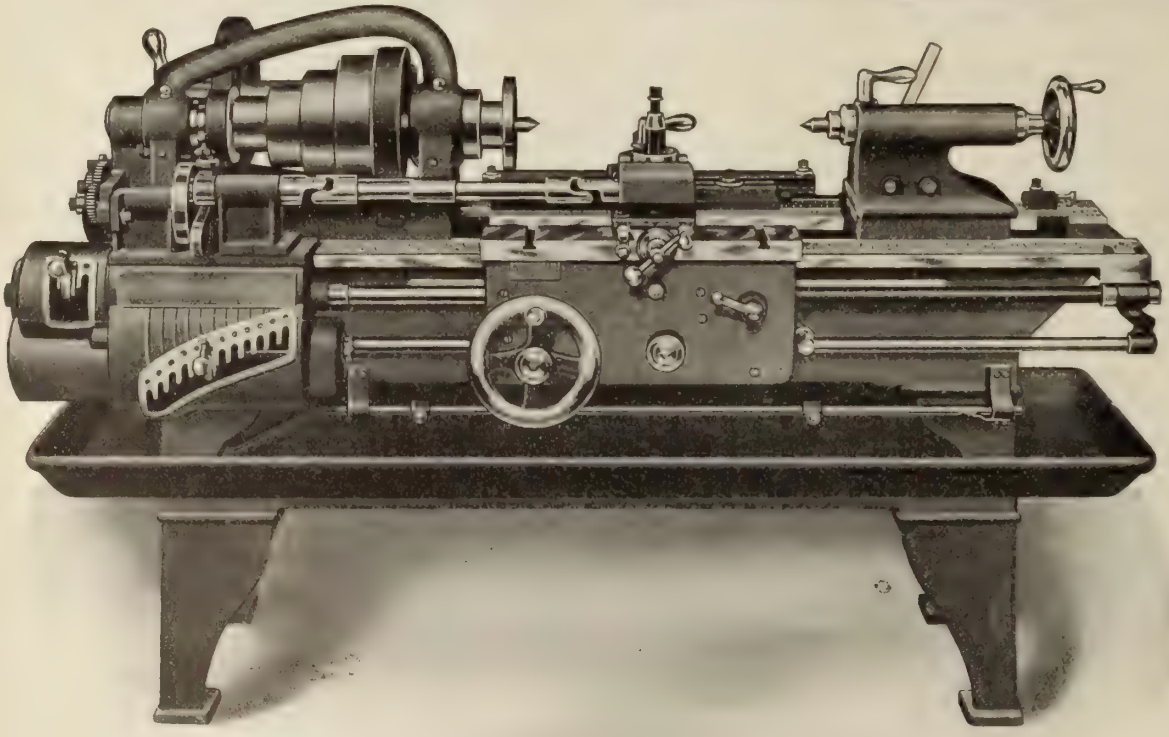
To take care of the work in your tool room, we can supply you with Universal Milling Machines, of which a suitable size is this No. 2.



And Lathes, such as this

HENDEY 16-INCH SWING LATHE

mounted in oil pan and fitted with Taper and Relieving Attachments, the latter for backing off the teeth of Taps, Cutters, etc., with mechanical precision. Watch Tool Chucks are also offered in sets from ½ to ⅞ by 16ths, making the Lathe very complete for handling a wide variety of work.



Both these Machines are more fully described in our Complete Catalogue, which we will be glad to mail you.

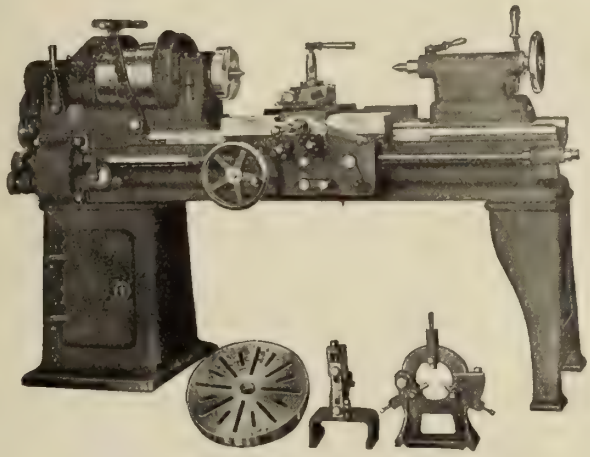
The Hendey Machine Co.
Torrington, Conn., U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal, Canada; General Supply Co. of Canada, Ottawa, Ont.

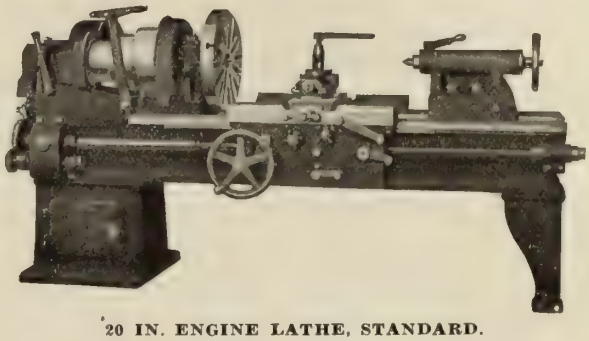
The advertiser would like to know where you saw his advertisement—tell him.

CANADA MACHINERY CORPORATION, LIMITED

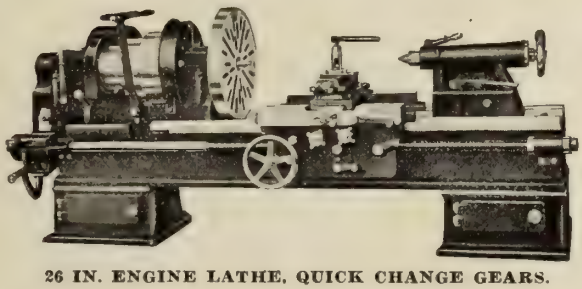
LATHES—LATHES—LATHES



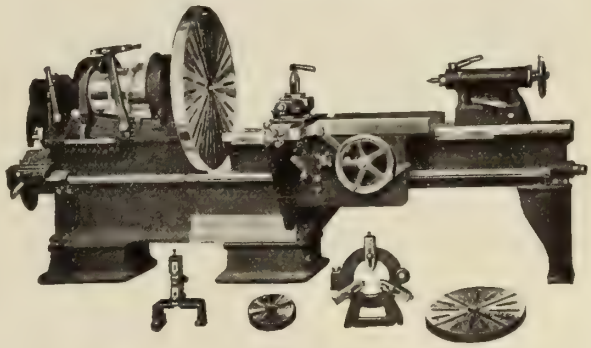
16 IN. ENGINE LATHE, STANDARD.



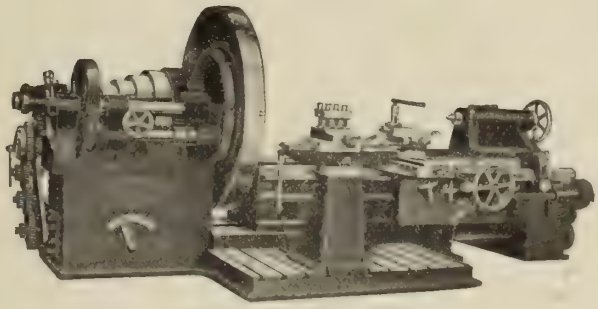
20 IN. ENGINE LATHE, STANDARD.



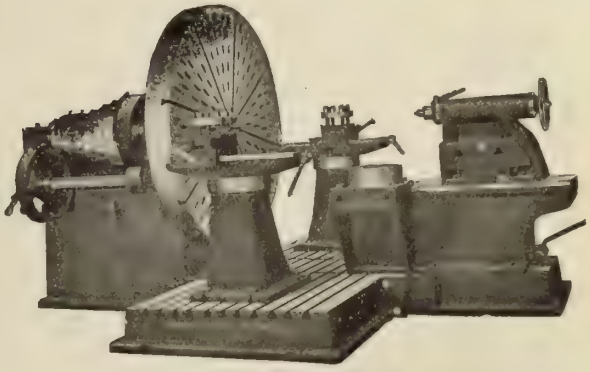
26 IN. ENGINE LATHE, QUICK CHANGE GEARS.



GAP LATHE, QUICK CHANGE GEARS.



86 IN. BREAK LATHE.



96 IN. FACE LATHE.

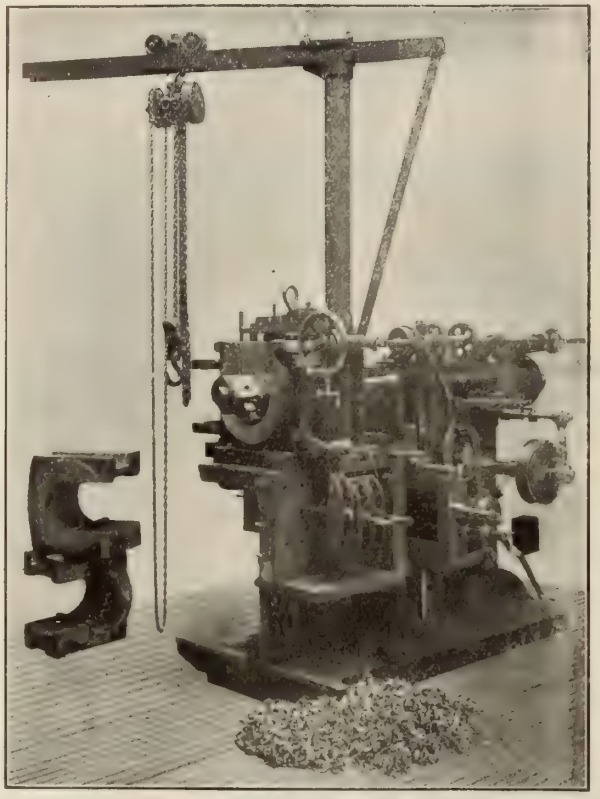
OUR LINE ALSO INCLUDES SHAPERS, PLANERS, PUNCHES AND SHEARS, DRILLS, SLOTTERS, BULL-DOZERS, DROP AND HELVE HAMMERS.

Catalogue and prices on application.

Canada Machinery Corporation, Limited

GALT, ONTARIO

The Morton Draw-Cut Railroad Shaper



This shaper will crown and plane axle boxes, plane the brass shell to fit, and plane shoes and wedges at a saving of from 25 to 40 per cent. over ordinary methods. This machine is also equipped for doing a general line of shaper work.

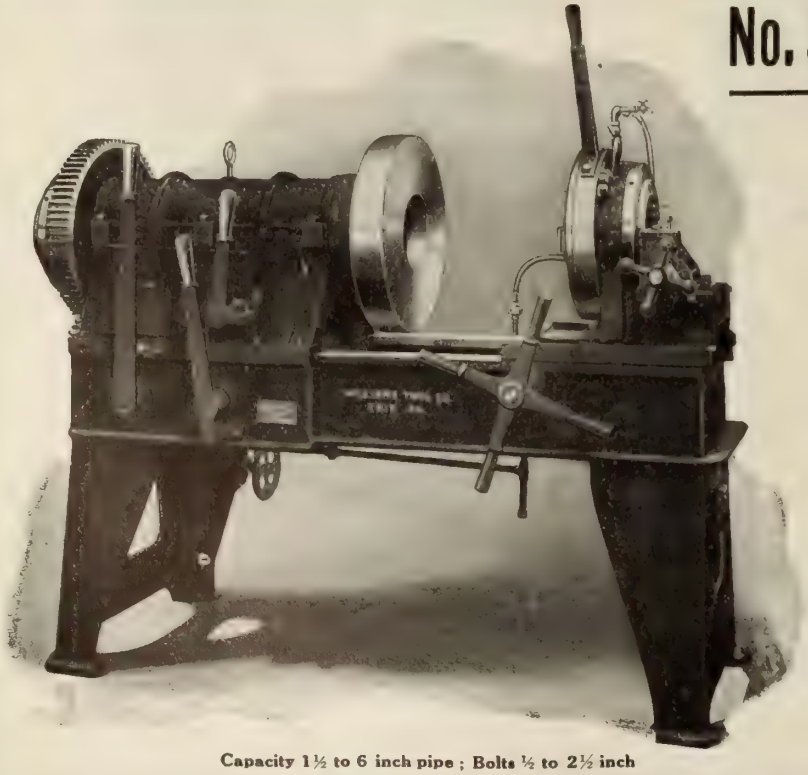
For further particulars address

The Morton Manufacturing Company

MUSKEGON HEIGHTS, MICH.

Also builders of Cylinder Planers and a full line of Draw-Cut Pillar Shapers.

No. 3 Williams Pipe Machine



Capacity 1½ to 6 inch pipe ; Bolts ½ to 2½ inch

Has every device for convenience, durability and speed.

The Williams Pipe Machines are made in six sizes: ¼" to 2" ; ½" to 3" ; 1" to 4"; 1½" o 6" ; 2" to 8" and 3½" to 12".

Designed for strength and accuracy, and unexcelled in efficiency, steady service and reasonable cost.

Sold by the

A. R. Williams Machinery Co., Limited

Toronto Montreal St. John Vancouver and Winnipeg

Send for Description and Prices.

WILLIAMS TOOL CO.

Box 18 Erie, Pa., U. S. A.

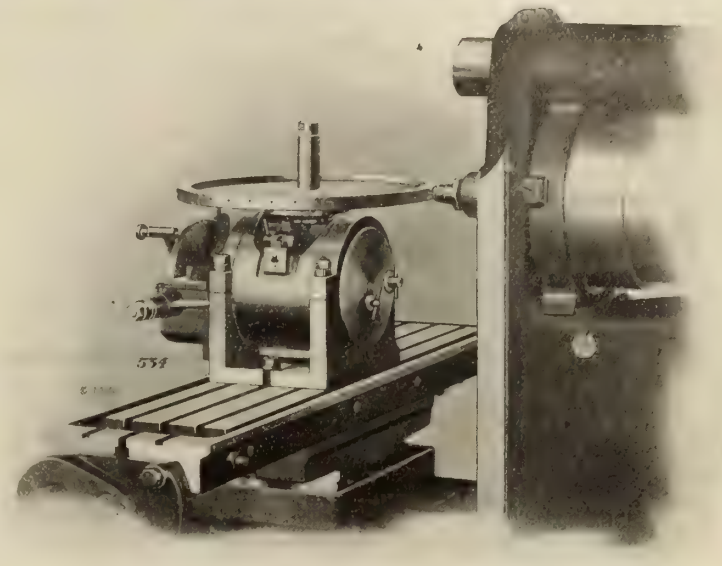
The advertiser would like to know where you saw his advertisement—tell him.

CINCINNATI UNIVERSAL TOOL ROOM MILLERS

Thirty-six holes ¼-inch diameter are spaced on the periphery of a 19-inch disk rigidly held on a 12-inch Index Head. They are first drilled, then bored, a trifle under size, and finally reamed to a plug gauge fit with a specially ground ¼-inch end mill. The error between holes is less than one thousandth (—.001 inch.) To get such results requires a miller that is accurate all over.

This is a good illustration of the best method of handling work of larger diameter than the index centres will swing. The swivel trunnions on our Dividing Head are large in diameter and fully protected in all positions, insuring permanency of alignment at any angle to which the spindle may be set.

Cincinnati Millers are as famous for their accuracy as for their productive capacity.

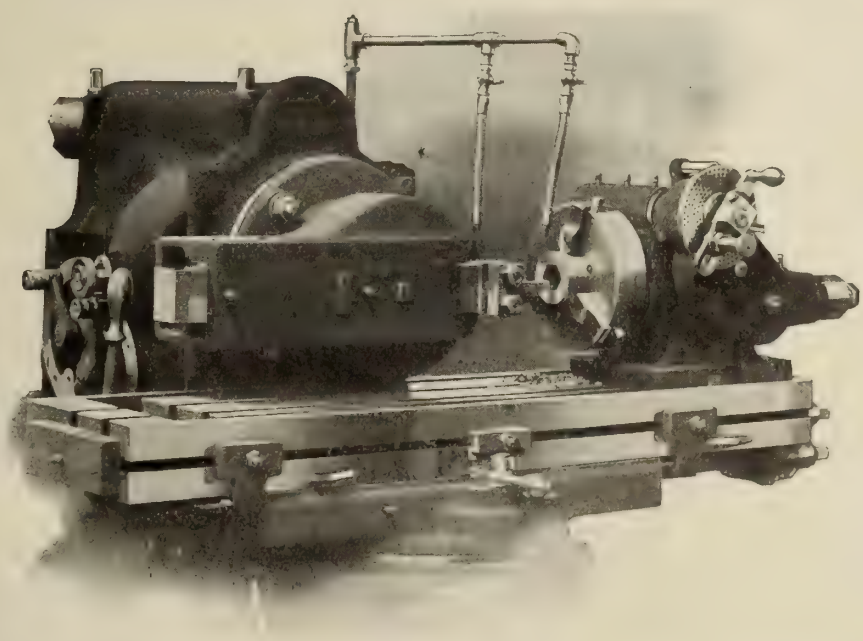


The Cincinnati Milling Machine Company

MILLING SPECIALISTS

CINCINNATI, OHIO, U.S.A.

Canadian Agent—H. W. PETRIE, Limited, Toronto, Montreal and Vancouver.



EVERY tool room should have a Milwaukee Universal Milling Machine, every universal milling machine should have a slotting attachment and every tool room foreman should have our latest book—to be had for the asking.

KEARNEY & TRECKER CO.

MANUFACTURERS MILWAUKEE, WIS.

Canadian Agents:—A. R. WILLIAMS MACHINERY CO., Toronto, St. John, Winnipeg, Vancouver
WILLIAMS & WILSON, Limited, Montreal

Garvin Circulars

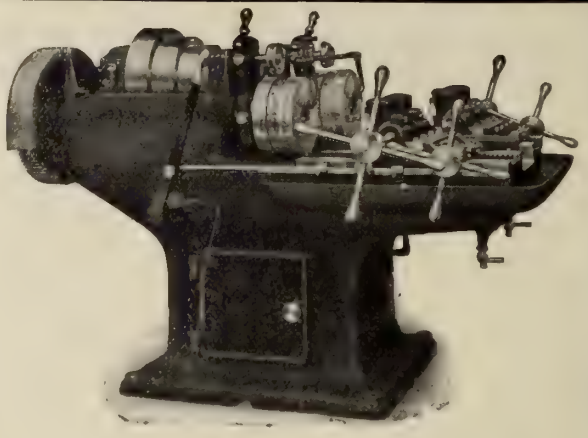
Frequent changes necessitate issuing circulars from time to time to keep our printed matter up to date. The following is a list of circulars, profusely illustrated, describing our latest improvements on the various machines mentioned. If any of these circulars may interest you, we shall be pleased to send you same on request:

Circular No.	MACHINE
128	No. 1½ Universal Milling Machine.
134	No. 2 Mfg. Universal Milling Machine.
136	No. 15 Plain Milling Machine, special 60 in. feed.
137	No. 14 Mfg. Plain Milling Machine.
138	Automatic Tapping Machines.
139	No. 22 Vertical Milling Machine.
140	Rapid Screw Slotter.
142	No. 14 and No. 15 Vertical Spindle Milling Machines.
143	No. 3 Duplex Milling Machine.
144	Duplex Horizontal Drills.
150	No. 11 and No. 12 Plain Milling Machines.
152	No. 2 Hole Grinding Machine.
153	No. 21 and No. 22 Plain Milling Machines.
154	No. 1, 2 and 3 Hand Milling Machines.
155	Thread Milling Attachment.
156	Automatic Chucks.
157	No. 1 Automatic Tapping Machine.
158	No. 9 Index Milling Machine.
159	No. 2-A Universal Milling Machine.
160	No. 3 Screw Machine.
161	Die Slotting Machine.
162	Trolley Wheel Machine.
163	Automatic Chuck, Stop and Open Countershaft.
164	No. 2-A Plain Milling Machine.
165	No. 2 Rapid Screw Slotting Machine.
167	No. 13 and No. 13½ Plain Milling Machines.
168	Grinders (Cutter and Surface.)
170	No. 22 Plain Milling Machines.
171	Motor-Driven Machine Tools.
172	No. 15 Plain Milling Machines.

FOR FURTHER INFORMATION { ASK YOUR DEALER OR WRITE US DIRECT

The Garvin Machine Co.

Spring and Varick Streets, NEW YORK CITY



Protected by Patents

Heap's High Speed Screwing Machines

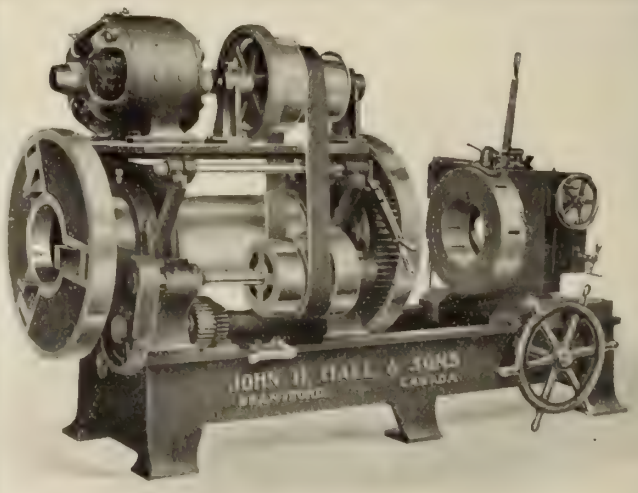
fully meet the demand for accurate and durable machines, unsurpassed in quality and containing the latest and best features for convenient operation, and large and accurate output. The perfecting of these machines did not happen at once; it took time and careful experimental preparation. Each of the new features embodied in these Screwing Machines has been under severe service and rigid test for a considerable period.

SEND FOR FULL PARTICULARS

Joshua Heap & Co., Ltd.,

ASHTON-UNDER-LYNE, ENGLAND

Canadian Agents: PEACOCK BROS., Montreal



PIPE THREADING MACHINES

Our No. 18, Duplex Improved, equipped with Peerless Die Head mechanism.

Capacity 8 in. to 18 in., either belt or motor drive.

Write us for prices on various sizes from ⅛ in. to 18 in. Also single and double head rapid nipple machines.

John H. Hall & Sons,

BRANTFORD, CANADA

The advertiser would like to know where you saw his advertisement—tell him.

KEMPSMITH

PLAIN MILLERS

Concentrated Operation.

Convenient Handling.

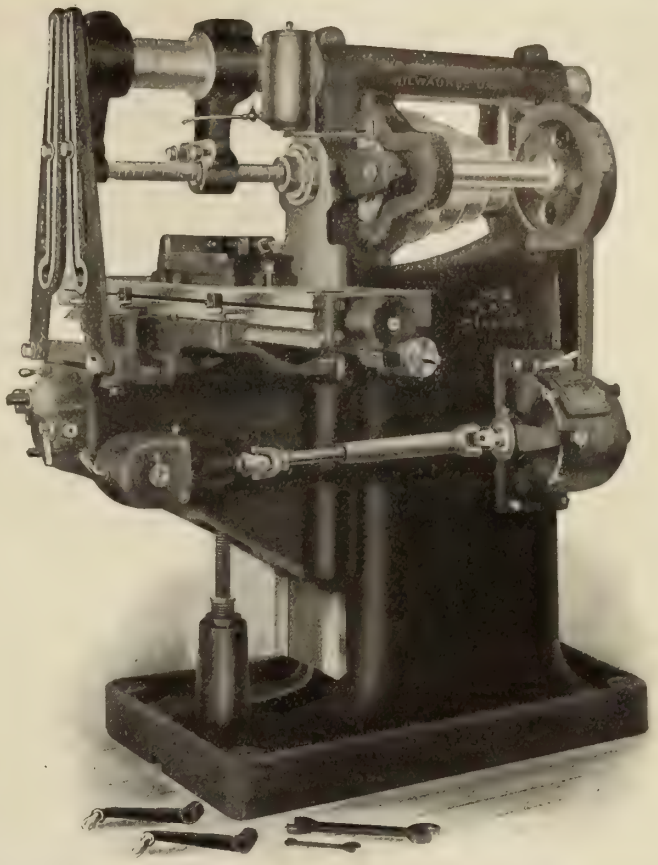
No confusing or complicated levers or parts.

No weak, delicate, limiting point.

Massive construction.

Highly developed geared feed change and tripping mechanism.

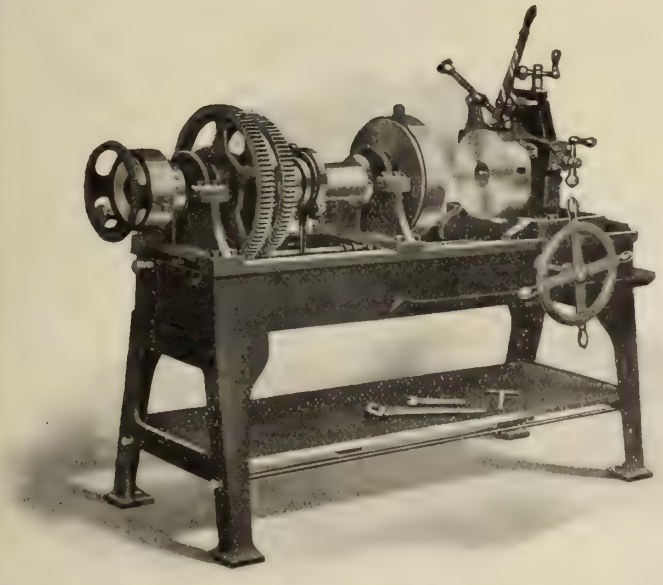
The Machine for ready handling in steady, severe service.



THE KEMPSMITH MFG. CO.

MILWAUKEE, WISCONSIN.

Get What You Want When You Want It



WHY BE SATISFIED with the ordinary pipe machine when you can get one with all the advantages and none of the disadvantages. If you want good threads, a long-life machine, easy to operate and dependable, that's the way of the B. & K.

MAKE US PROVE IT.

BIGNALL & KEELER MFG. COMPANY

EDWARDSVILLE, ILLINOIS, U.S.A.

Selling Agents for Canada—Canadian Fairbanks Co., Ltd., Montreal, Toronto, St. John, N.B., Winnipeg, Calgary, Vancouver

You pay for every minute of the machine's and the operator's time

But Only Productive Time Pays You

Productive time—
Wasted time—

The total time a machine is operating separates itself into these two parts.

The manufacturer pays for both.

But only productive time repays him.

The Bullard Vertical Turret Lathe is designed to give the greatest possible amount of productive time.

Wasted time is reduced to that point where it is only absolutely necessary time between operations.

To accomplish this there are a number of features:—

Vertical Construction makes chucking an easy matter.

Centralized Control saves unnecessary steps.

Quick Speed Change makes it easy to maintain proper cutting speed.

Rapid Power Traverse reduces the physical effort required.

Observation Stops reduce the time required for measuring to a minimum.

Two heads, a Turret Head and a Side Head, enable two or more tools to work simultaneouly—Multi-Cutting—and at the same time each head carries a series of tools in instant readiness for a sequence of operations.

These features combine to give the Vertical Turret lathe the greatest amount of productive time.

On all face plate work within its range, the costs are correspondingly lower.

Take it up with our Time Study Department.

WRITE FOR A COPY OF OUR TREATISE ON FACE PLATE WORK NO. C-15.

The Bullard Machine Tool Co.

BRIDGEPORT, CONN., U. S. A.

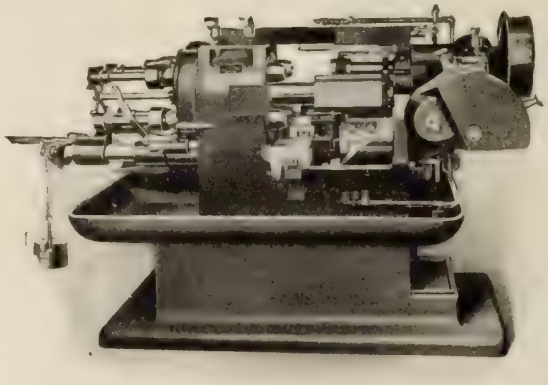
The Gridley Automatic Turret Lathe

Gives a Service That Is Entirely Different From That of Other Makes

and the manufacturer who takes advantage of this service is the man who will save money and increase his output.

The "GRIDLEY AUTOMATIC" handles work of greater length and of more complex character than any other machine of this kind.

Its construction is very simple, enabling one operator to run several machines at once, and to use tools tandem, thereby increasing production.



"GRIDLEY" SINGLE SPINDLE.
We also manufacture the Gridley Multiple Spindle Automatic.

The "GRIDLEY" is the only automatic that gets away from the old box tools and uses extra strong tools on the slide.

Every cut that the "GRIDLEY AUTOMATIC" makes is accurate, smooth and perfectly uniform from start to finish. If you are interested in machine shop economy, write us at once for catalog and prices.

Windsor Machine Co., Windsor, Vt., U.S.A.

Manning, Maxwell & Moore, Inc., Agents for United States and Canada. Craven Bros., Ltd., Manchester, Eng., Manufacturers and Sole Agents for Great Britain and Colonies. M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany, Agent for Germany, Belgium, Italy, Holland, Switzerland, Austria-Hungary. Office for France, 68 Avenue de la Grande Armee, Paris, France. J. Ryan, Manager.

You Can Double Your Output If You Install a

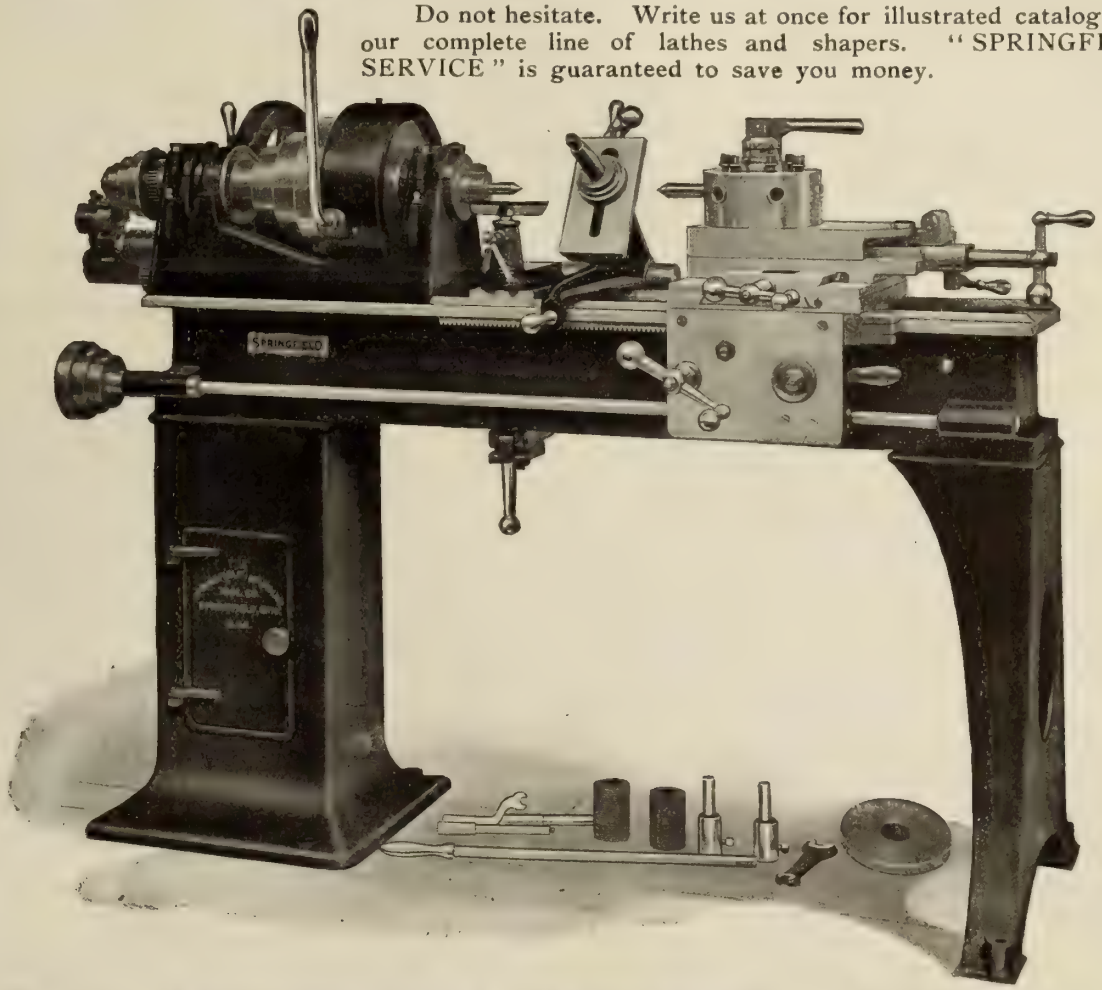
"SPRINGFIELD" Cabinet Turret Lathe

This is one of our latest productions and it contains several new features and improvements that ensure a maximum output at minimum cost. Its accuracy, speed and efficiency cannot be equalled.

The turret is so designed that one slight backward movement of the blades loosens the turret and at the same time withdraws the locking pin; a slight forward movement then produces the partial revolution of the turret for the next tool, and simultaneously locks and tightens it, the entire operation being done in a second or so by one hand.

This lathe is back geared, and has a four-step cone pulley of large diameter.

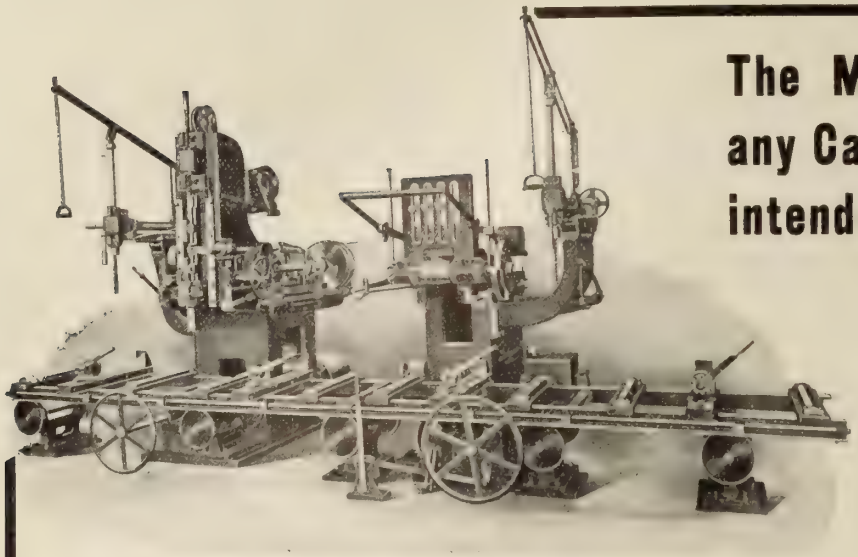
Do not hesitate. Write us at once for illustrated catalogue on our complete line of lathes and shapers. "SPRINGFIELD SERVICE" is guaranteed to save you money.



The Springfield Machine Tool Co.

SPRINGFIELD : : OHIO, U.S.A.

Canadian Agents, MUSSENS LIMITED, Montreal. Toronto, Winnipeg, Vancouver.



The Most Valuable Asset to any Car Manufacturer, Superintendent, Master Mechanic or Car Shop Foreman, is a

FAY & EGAN

Combination No. 214

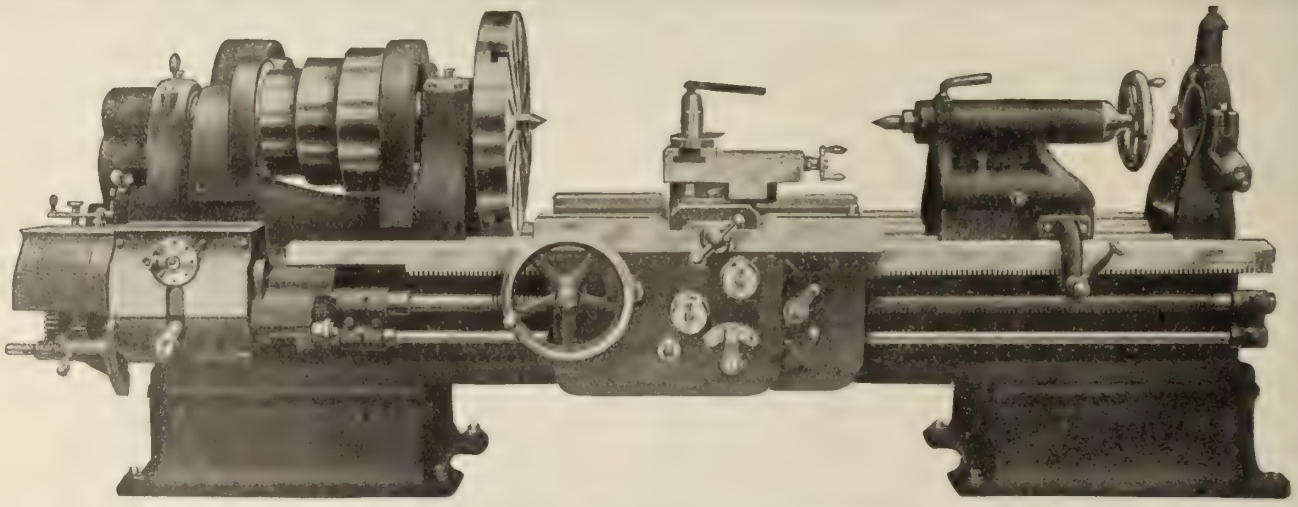
Vertical Hollow Chisel Mortiser and No. 150 Auto Car Gainer

With it you can Mortise, Bore and Gain the heaviest car timbers without moving them from one machine to another. When you consider the high quality of work and its economical production with this machine, you cannot fail to recognize its absolute necessity in a modern Car Shop.

OUR CAR SHOP CATALOG FREE TO INTERESTED RAILWAY MEN.

If you haven't a copy of it or of our No. 84 complete catalogue for handy reference, send us your name and address on a post card and they will be sent at once. Both will be valuable to you.

J. A. FAY & EGAN CO. 362-382 W. FRONT STREET, CINCINNATI, - OHIO.



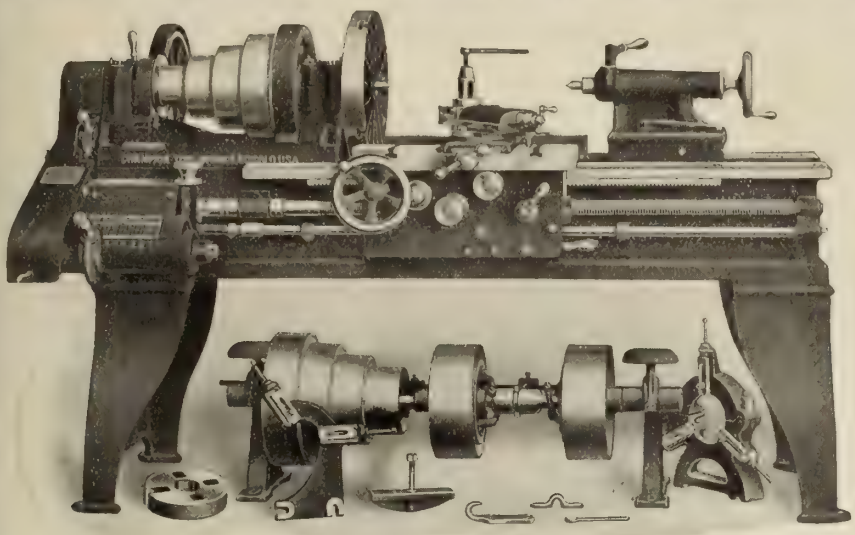
26-inch Instantaneous Change Gear Engine Lathe

The headstock is of the double back geared type. **Maximum belt pull is transmitted to the cutting tool.** The double plate apron is of the most rigid construction possible. Tailstock provided with pawl to engage rack cast in bed. In every detail, this machine is strong, powerful and durable. It is the ideal tool for the modern machine shop, *Descriptive circulars on request.*

Schumacher & Boye

Engine Lathes **Cincinnati, Ohio, U.S.A.**

FACTS ABOUT CHAMPION LATHES WORTH CONSIDERING



16-in. Quick Change Lathe.

In comparing Lathe Design you should go beyond a few of the "Top Heavy" catchy points of extra dimensions for one or two parts of the machine and see if they are in keeping with the rest of the Lathe.

You won't have any particular need of a Large Spindle Bearing if it takes up so much Headstock space as to necessitate a small cone and consequent narrow belt.

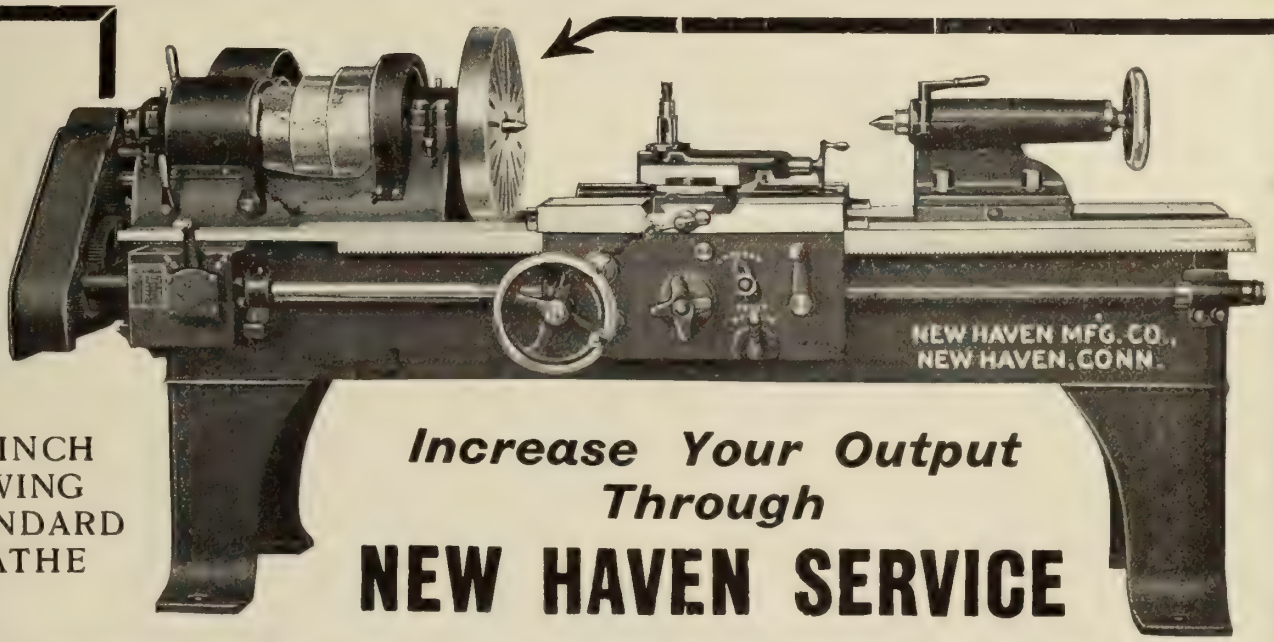
Big and little dimensions don't work hand in hand.

What you need is a machine of **Well Balanced Design**, and you get it in the **CHAMPION**.

READ ABOUT IT IN OUR CATALOGUE OF 10, 12, 14, 16 and 18 IN. LATHES.

CHAMPION TOOL WORKS COMPANY

Station "B" CINCINNATI, OHIO, U.S.A.



18-INCH SWING STANDARD LATHE

Increase Your Output Through

NEW HAVEN SERVICE

We are one of the oldest manufacturers of lathes on the continent—manufacturers of lathes that have met with the highest approval.

Before placing our products on the market we put them through severe tests and guarantee them as regards to quality of material, workmanship and accuracy, and recommend them as regards to design and convenience of operation.

We carry a large stock of lathes and can fill all orders promptly and make quick shipments.

WRITE FOR CATALOG AND PRICES.

New Haven Manufacturing Co. NEW HAVEN, CONN., U.S.A.

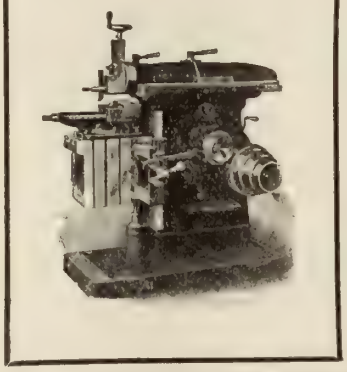
WE Carry the Largest Stock of CLEVELAND High Speed and Carbon Twist Drills and Reamers in Canada.

Full range of sizes. Prices are right. Send us your requisition.

The General Supply Company of Canada, Limited

OTTAWA TORONTO WINNIPEG

115-125 Adelaide Street West



Steptoe Shapers are

GOOD: Because of the care taken in construction.

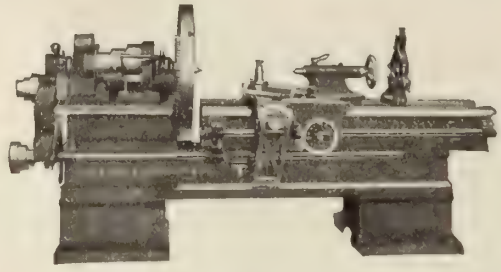
STRONG: Because the Column, Ram and Base are heavily ribbed and braced and the metal placed where it is needed.

DURABLE: Because all wearing surfaces are hand scraped to standard surface plates and provided with gibs to take up any wear.

The John Steptoe Shaper Co.

1953 Jessamine Street - - - - CINCINNATI, OHIO

Agents: GENERAL SUPPLY CO. OF CANADA, Limited, Ottawa, Toronto and Winnipeg



16-32 Extension Gap Lathe

This Lathe fills the gap between a 16″ and 32″. Takes care of all diameters between above sizes. Besides the gap, there is the extra distance between centres, 7 ft. on 8 ft. bed obtained.

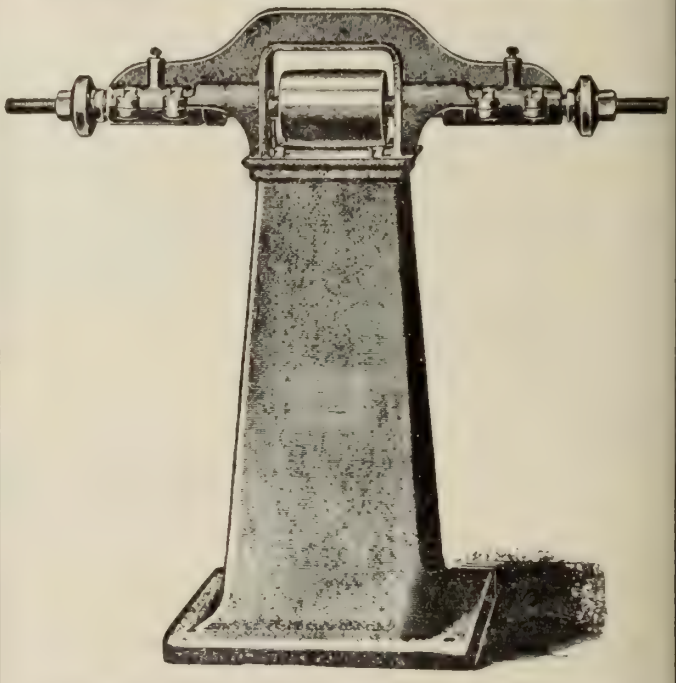
The Bed is moved by power taken from the feed rod. Double Back Geared Head Stock and Triple Geared direct into the full swing faceplate; Double Triple Gear Bearing; Positive Lock for Back Gears and Triple Gears, to permit throwing out, under heavy cut.

FAY & SCOTT - Dexter, Maine

Complete line of Standard Engine, Extension Gap and Patternmakers' Lathes, Planers and Shaper Centers.

Canadian Agents—Williams & Wilson, Montreal, Que.; A. R. Williams Machinery Co., Toronto; A. R. Williams Machinery Co., Winnipeg; General Supply Co. of Ottawa, Canada.

No. 8 Buffing and Polishing Lathe



We make all sizes. All prices. Let us quote you.

Pendrith Machinery Company

Manufacturers

970-972 Queen Street West - - Toronto

The advertiser would like to know where you saw his advertisement—tell him.

Highest Quality

MACHINE TOOLS

"Keep Us in Mind"

We have the most complete line of high quality machine tools and supplies in Canada—a line which we can safely recommend to every up-to-date machine shop as being inferior to none.

Our salesmen are at your disposal and will take pleasure in suggesting any piece of machinery that will enable you to increase your output and bring better results.

During the many years that we have been in the supply business, we have won a reputation for square dealing and quick, efficient service. OUR PRICES ARE RIGHT.

Here are a few of the companies that we represent:

R. K. LeBlond Machine Tool Co.
Cincinnati Shaper Co.
Cincinnati Gear Cutting Machine Co.
Von Wyck Machine Tool Co.
Mueller Machine Co.
John Steptoe Shaper Co.
King Machine Tool Co.
H. G. Barr.
London Machine Tool Co.
Domestic Engine & Pump Co.
South Bend Machine Tool Co.
Van Dorn & Dutton Co.
Fay & Scott.
Loew Manufacturing Co.
Cleveland Twist Drill Co.
Chicago Flexible Shaft Co.
Brown & Sharpe Mfg. Co.
Detroit Seamless Steel Tubes.
Standard Pressed Steel Co.
Chicago Watchman's Clock Co.
Beardmore Belting Co.
E. C. Atkins Co.
Vi-Balata Belting.
Prescott Emery Wheel Co.
Russell Chuck Co.
Reed Mfg. Co.
H. & E. Lifting Jack Co.
Thomas Grate Bar Co

We Carry the Largest Stock of Cleveland Twist Drills in Canada

We handle a full line of Mill and Contractors' Supplies, Power Transmission Equipment and Supplies, etc., Valves and Fittings, Bolts, Nuts and Washers, Set and Cap Screws, etc., Packing, Belting.

The General Supply Co. of Canada, Limited

OTTAWA TORONTO WINNIPEG

115-125 ADELAIDE STREET WEST

Don't fail to mention this paper in writing to advertisers.



The Wheels Your Men Can Depend Upon

ALOXITE GRINDING WHEELS

When an Aloxite wheel is put on the arbor it stays there until worn out. No question about its work—fast, clean, cool-cutting every minute—no rasp or screech—cuts easily, quietly.

The man in the illustration is grinding lathe tools in a Philadelphia shop. He is using a 16-inch *Aloxite wheel.* Both he and his foreman say it is the best wheel they ever had in the place—holds its shape—never glazes—doesn't burn the tools.

Your men wouldn't ask for a better wheel—They couldn't get it. Let us help you get the right wheel in the right place.

The

Carborundum Company

Niagara Falls, N.Y.

AGENTS:
Norman Macdonald, 145 Wellington St. West, Toronto, Can.
McLennan, McFeely & Co., Vancouver, B.C.
Williams & Wilson, Montreal, Que.
A. R. Williams Machinery Co., of Winnipeg, Ltd., Winnipeg, Man.

Don't Wait Until To-morrow

to send in your request for full particulars regarding

BLOUNT'S

Wet Tool Grinder

Do it at once, as the sooner you get acquainted with "Blount Service" the more money you will save.

This Wet Tool Grinder is an absolute necessity in every shop, as it puts a perfect edge on all tools being sharpened.

"BLOUNT'S" Grinder can be run continuously if desired, as it is fitted with self-oiling bearings and there is positively no wear of parts, because the propeller of the pumps, furnishing a constant supply of water, is loosely fitted and cannot touch the case at the nearest point. It has a sleeve cap that prevents leakage without the use of packings.

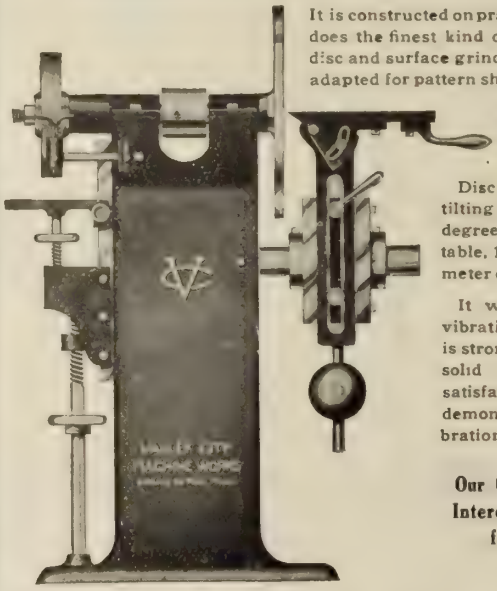


J. G. Blount Co.

EVERETT, MASS., U.S.A.

No. 9 Disc and Surface Grinder

Here is the Machine That will Meet ***Your*** Requirements.



It is constructed on practical lines and does the finest kind of work. This disc and surface grinder is especially adapted for pattern shops, die makers and all kinds of tool and surface grinding

Disc side has table tilting from 0 to 43 degrees. Size of disc table, 10 x 10 in. Diameter of disc, 18 in.

It will solve your vibration problem. It is strongly built of one solid casting; and satisfactory tests have demonstrated that vibration is avoided.

Our Catalogue will Interest You. Write for it now.

Valley City Machine Works

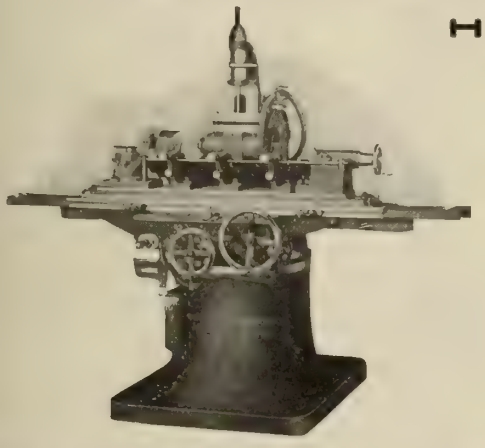
20 Compau Street

GRAND RAPIDS MICHIGAN

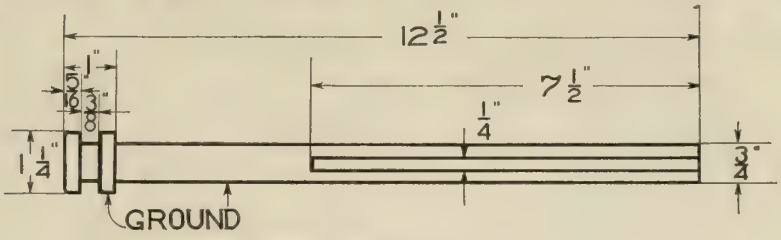
The advertiser would like to know where you saw his advertisement—tell him.

The Installation of a Bath Grinder Means That Your Work Will Be Put On the Most Profitable Basis

A comparison of figures between the Bath way of handling grinding work and other methods, will prove the high efficiency of BATH GRINDERS.



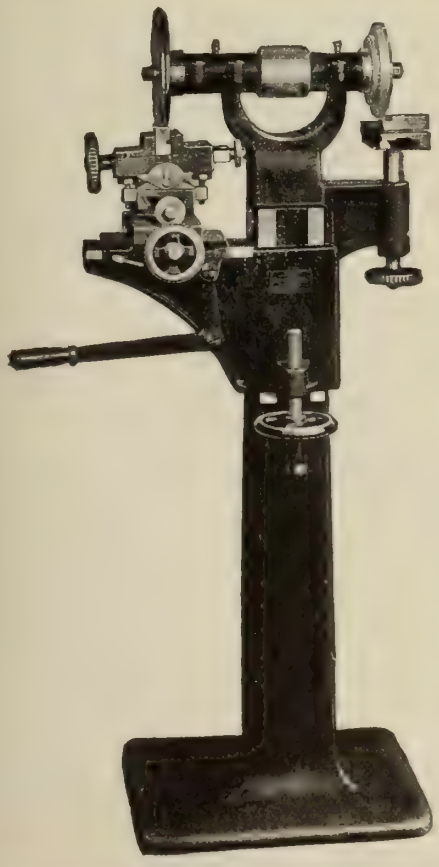
HERE IS JUST ONE CASE:



40% carbon steel shaft.
Grinding limit variation, .00025.
Stock removed, .015 on dia.
Two sizes ground.
Time, 7½ min.

Write us your problems and let us give you our production estimate.

The Bath Grinder Company, Inc., Fitchburg, Mass., U.S.A.



What is Your Method of Grinding Thread Chasers?

You know that it is practically impossible to keep threading tools in shape or to regrind them satisfactorily by hand.

The Geometric Chaser or Die Grinder

touches up all Chasers of a set uniformly and keeps them in condition for accurate work.

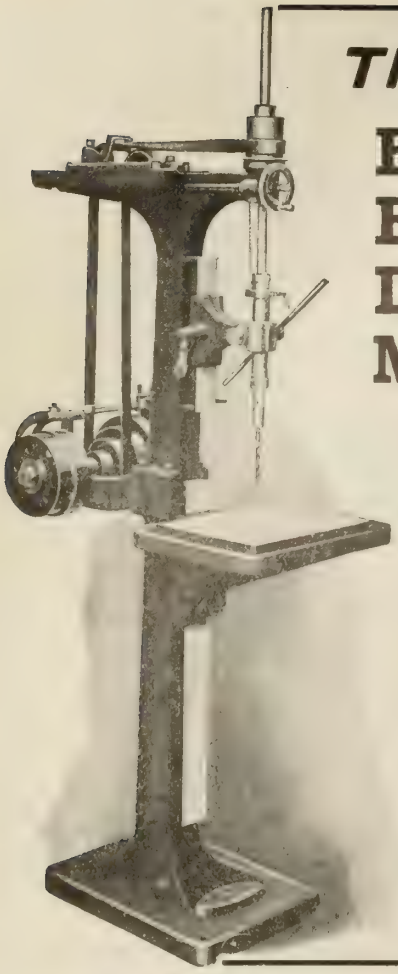
The machine is adapted for grinding any make of thread Chaser, whether of a stock or special type, and is also equipped with a second grinding wheel for ordinary tool grinding.

In shops where much screw cutting is done, one of these machines will save its first cost in a short time in labor alone, and Chasers that are kept properly ground will last a great deal longer and do far better work than Chasers that are subjected to the hit-or-miss hand grinding.

Let us send you our Special Booklet describing this Chaser Grinder.

The Geometric Tool Company, New Haven, Conn.

Canadian Agents:
Williams & Wilson, Montreal. A. R. Williams Machinery Co., Toronto.



The AVEY

Ball Bearing Drilling Machine

will give you

Greater Production at Reduced Cost

because it can be run at higher speed than other machines, and it is the quickest, simplest and easiest adjusted.

NO TIME WASTED.

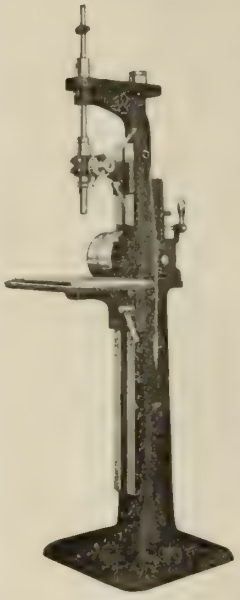
Built in single and multiple spindles. Various sizes.

Get our circulars.

THE
Cincinnati Pulley Machinery Co.
CINCINNATI

Manufacturing Drilling Machines

OF HIGHEST EFFICIENCY



16 SIZES, 5 TYPES

FOR DRILLING HOLES ¾ INCH AND UNDER

They have rigidity for heavy work and power to drive high speed steel drills to the limit of endurance.

Compact in shape, only the minimum floor space is required; silent chain and positive gear drive replace the usual belts; every operating convenience to save time and labor.

Write for latest Catalog—full line of Drilling Machines, Bench Lathes, Foot Presses, Special Machinery

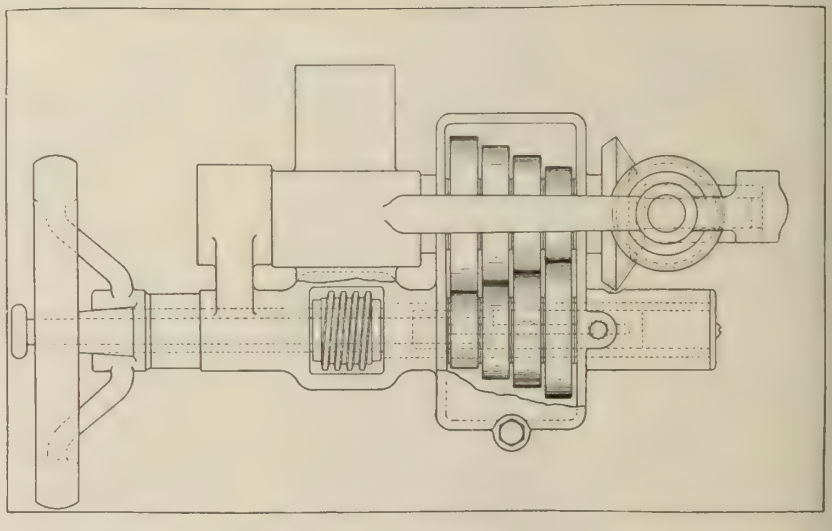
THE TAYLOR & FENN COMPANY
HARTFORD, CONN., U S.A.

No Exposed Gears!

This Extremely Simple and Compact Feed Mechanism

accomplishes as much as the many more complicated geared feeds now on the market.

The semi-steel gears as well as the steel worm being on horizontal shafts, can be kept continually immersed in oil. The feed change knob is located in the most convenient place — in the centre of the hand wheel.



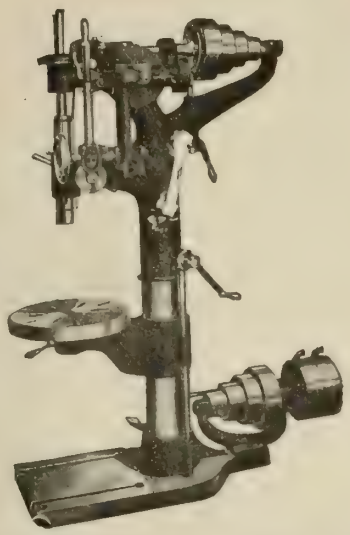
All Sibley Drilling Machines

from 24″ up, equipped with this feed.

Sibley Machine Tool Co.

Church Lane **South Bend, Ind.**

The BARNES DRILLS



Complete line. 8 inch to 50 inch swing.

Gang Drills.—Horizontal Drills.

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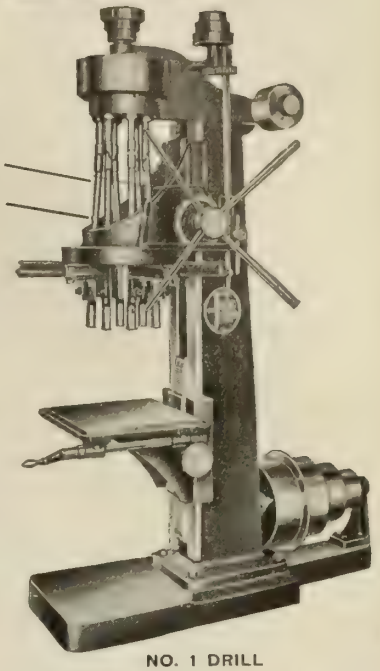
W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO.
Toronto, Montreal, Winnipeg, Vancouver, St. John, N.B.

TRADE FOX MARK

WRITE US TO-DAY STATING YOUR REQUIREMENTS



NO. 1 DRILL

NOTE!

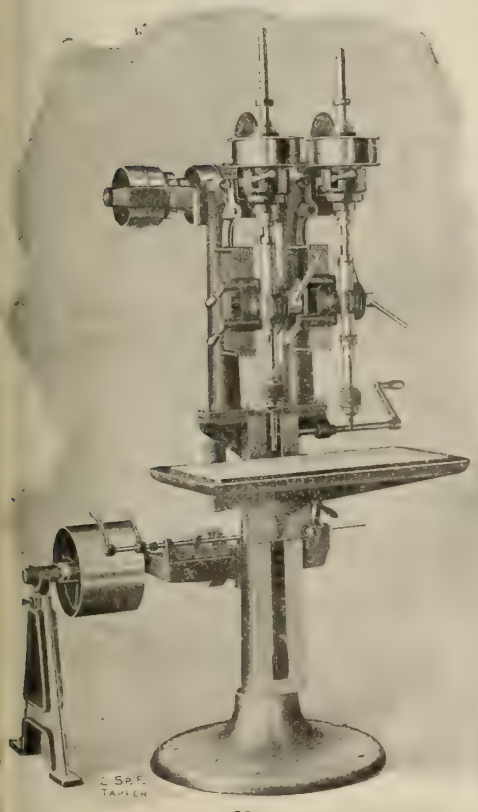
How convenient to operator every operating lever on machine is located.

Our construction of Spindle Bearing and Supporting Arm will interest you.

MULITPLE SPINDLE DRILLS
FOR EVERY NEED

FOX Machine Co.

23 N. Front Street, Grand Rapids, Mich. 30 Church St., N.Y. City
Canadian Representatives: The A. R. Williams Machinery Co., Limited
95-97 Front Street, Toronto, Ontario



E. 2 SPECIAL

Install a "BARR"

Combined Drilling and Tapping Machine.

It Means Machine Shop Economy

The "Barr" Combined Machines will do drilling and tapping equally as well as two separate drilling and tapping machines and will save much space, time, labor, and handling.

We can also give you power feed, lever feed, and tappers in any combination from two to seven spindles to a machine.

Do not hesitate in writing us at once. Let us help you save money.

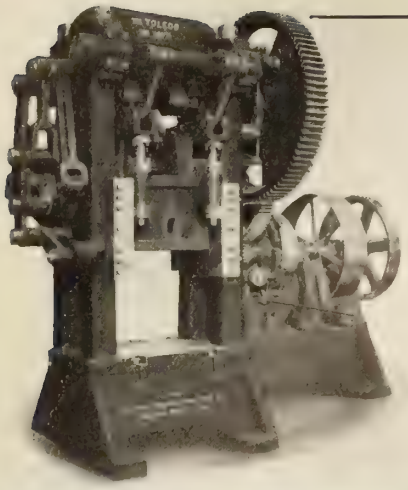
Circulars on Request.

H. G. BARR, Worcester, Mass., U.S.A.

WILLIAMS & WILSON, Montreal—Agents for Eastern Canada

The General Supply Co., of Canada, Ltd.

OTTAWA TORONTO WINNIPEG



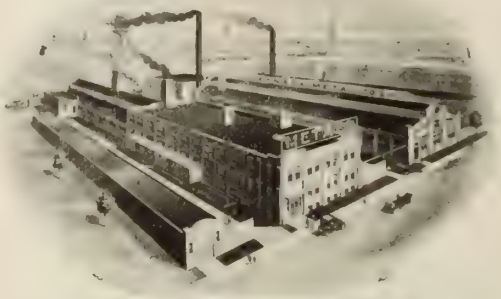
Stipulating Lowest Price Means SACRIFICING QUALITY

"TOLEDO" QUALITY is NOT BUILT on a COMPETITIVE PRICE BASIS. Every Shear, Hammer, Die or Special Machine is built with but one idea and aim—to have it the BEST of anything that has EVER BEEN BUILT. THAT IS THE WAY WE have built OUR REPUTATION.

"TOLEDO" TOGGLE DRAWING PRESSES are a combination of ALL THE BEST and NONE OF THE BAD Features for Presses of this type.

DETAILS FOR THE ASKING

The Toledo Machine & Tool Company
TOLEDO, OHIO, U. S. A.



OUR NEW FACTORY
Our New Phone Numbers—Parkdale 761, 762, 763, 764

Our Specialties—

Brass, Bronze and Aluminum Castings

WE MAKE THEM RIGHT WE MAKE THEM QUICK
WE DELIVER PROMPTLY

The Canada Metal Co., Limited
FRASER AVENUE, TORONTO

VENEER PRESSES

Hydraulic Power Screw Any Pressure Any Size

WRITE FOR FULL PARTICULARS

The Canadian Boomer & Boschert Press Co., Ltd.
18 TANSLEY STREET, : : MONTREAL.



High-Speed Steam-Hydraulic Forging Presses

Double your production with one-half your labor cost and steam consumption. Cost of repairs reduced. Eliminates heavy shocks and vibration.

"SINGLE LEVER CONTROL"

Small sizes—single-frame type. Large sizes—four-column type.
Built for doing all classes of forging, shearing or pressing.

100 Tons to 12,000 Tons Capacity

UNITED ENGINEERING & FOUNDRY CO.

2305 Farmers Bank Building, PITTSBURG, PA.

EXCLUSIVE MANUFACTURERS FOR UNITED STATES, CANADA AND MEXICO
Manufactured under Davy Bros., Ltd., Patents.

BLISS For The Manufacture of Locks, Hardware, Cutlery, Etc. BLISS

"Stiles" Punching Presses



The design of the frame combines greatest strength and rigidity with convenience for handling dies and material. Adjustments are rapid, convenient and very accurate. All pressure is transmitted through solid metal. Slides are well gibbed. Send for Catalogue No. 2G describing them.

10 Sizes
All in Stock.

"PRESSES FOR EVERY PURPOSE"

E. W. BLISS CO., 20 ADAMS ST., BROOKLYN, N.Y.

London Office--114 Queen Victoria St., London E.C., Eng.

AN ECONOMICAL

IMPROVED POWER HACK SAW

Economical, because it gives a long, reliable service and produces excellent results at very little cost.

This Hack Saw saws bars 6x6 inches, either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

The special feature of this machine is the Improved Saw Guide which keeps the saw perfectly in line at all times.



Get our Prices and Catalog

D. McKenzie, Guelph, Ont.

POWER PUNCHING AND SHEARING MACHINERY

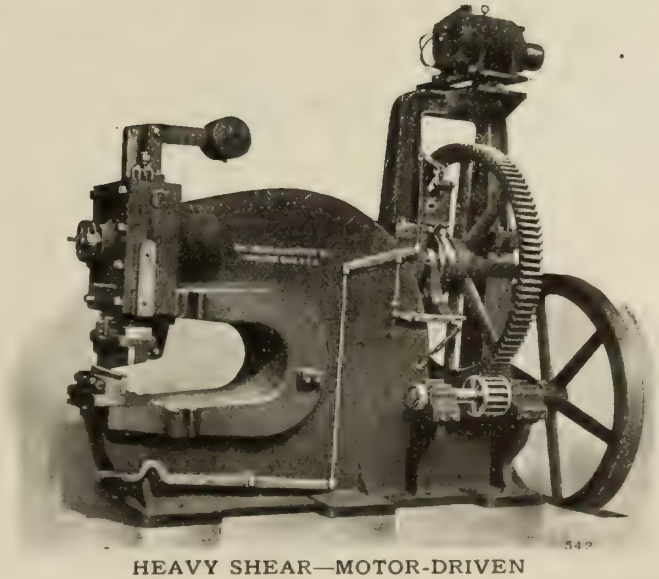
Single and Double for any number of holes.

Horizontal and Vertical.

Belt, Steam and Electrically Driven.

For Light and Heavy Work.

Ask for their Catalogue and send them your specifications.



HEAVY SHEAR—MOTOR-DRIVEN

Beam Punching and Coping Machines.

Riveting Machines.

Armature-Disc Notching Machines.

Tire Welding Machines.

Tire Bending Rolls.

Bending and Forming Machines.

Drop and Helve Hammers, Etc., Etc.

Designed and Manufactured by

THE LONG & ALLSTATTER CO.

Hamilton, Ohio, U.S.A.



Nicholson-Made Files



Lead in QUALITY and TEMPER

This is not merely an assertion, but an absolute fact. Comparison has proved it.

The scientific methods used by the Nicholson File Co. have enabled them to make a file that does more work and does it faster than any other file made.

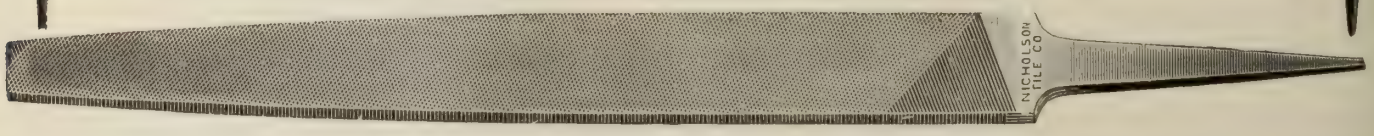
If you are not using the Nicholson-Made, buy one at your first opportunity. We guarantee it to give the highest satisfaction.

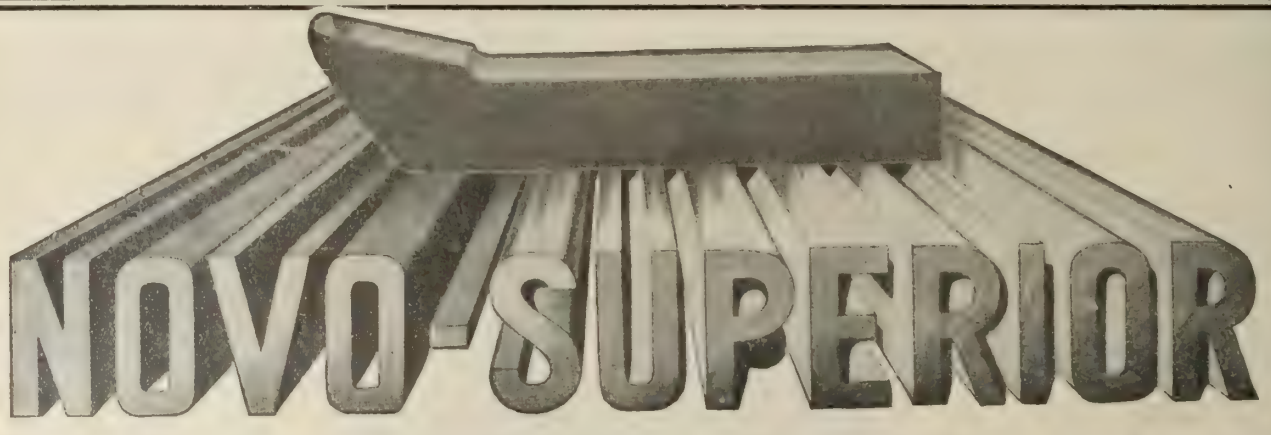
Nicholson-Made Brands manufactured in Canada are:—
AMERICAN, ARCADE, GREAT WESTERN, GLOBE,
EAGLE, McCLELLAN, KEARNEY & FOOT, J. B. SMITH.

ASK YOUR JOBBER TO LET YOU SEE THEM.

NICHOLSON FILE CO.

DOMINION WORKS - - PORT HOPE, ONT.





High Speed Steel Has a Solid Foundation In a Name That Means Something

Cutting speed attained on cast iron: Roughing cut, 140 ft. per minute—finishing cut, 210 ft. per minute.

In NOVO SUPERIOR you secure a materially increased speed over the high speed steels now in use, the highest quality, greatest toughness, longest life (3 times that of any other) and exceptional ability to cut very hard materials. The cutting edge retains its sharpness from 3 to 4 times longer than other high speed steels. Hardens in oil, air or water, and is now carried in stock in our warehouse in all current sizes, flat, squares and rounds; annealed and unannealed.

SEND US A TRIAL ORDER AND CONVINCE YOURSELF

HERMANN BOKER & COMPANY

332 ST. JAMES ST., MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.

FIRTH'S TOOL STEELS

are not just "good enough" to be accepted by the Trade, they are the ***best*** that can be manufactured, hence their superiority.

We carry the largest stock of FINE TOOL STEEL in Canada.

FIRTH'S **EXTRA** TOOL STEEL

FIRTH'S **BEST** TOOL STEEL

Round, Square and Flat sizes Annealed, for Cutters, Taps, Reamers, Drills, Punches, Shear-blades, Dies of all kinds, Rivet Snaps, Knives, etc., etc.

Octagons and Squares, for Chisels, Sets, Mining Drills, etc., etc.

THOS. FIRTH & SONS, Limited

STEEL MANUFACTURERS

Norfolk Works: SHEFFIELD, England

Canadian Warehouse: 507 St. Paul Street, Montreal

J. A. SHERWOOD, Agent



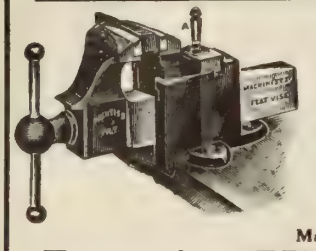
Manager for Canada: THOS. HAMPTON, 330 St. James St., Montreal

Don't fail to mention this paper in writing to advertisers.



HINTS TO BUYERS

Do Not Be Misled by Inferior Imitations.



There is but one

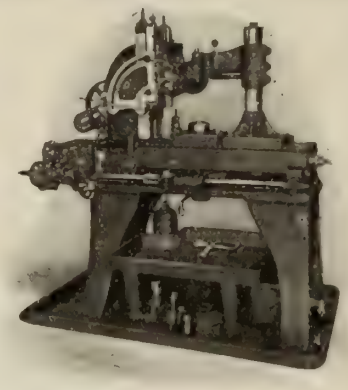
PRENTISS VISE

Made by

Prentiss Vise Company

Hardware Building, 106-110 Lafayette St., Cor. Walker St., NEW YORK

Sole Agents for Canada: A. Macfarlane & Co., Coristine Bldg., Montreal.
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The Whiton
AUTOMATIC
Gear Cutting
Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.



A Dividend Earner

ROCKWELL ANNEALING FURNACES are earning dividends for others—

WHY NOT YOU?

Unexcelled for all operations requiring accurate and uniform heating of brass, copper, German and sterling silver parts, etc.

Write for Catalog No. 26

W. S. ROCKWELL COMPANY

50 CHURCH ST., NEW YORK (Hudson Terminal Bldg.)
(The Original Furnace Rockwell)

NORTON JACKS

Standard on the Leading Railroads

Made in Canada.
Stock carried for **immediate shipment.**



Manufactured only by

A. O. NORTON,

COATICOOK,
Prov. QUEBEC.

STOCK CARRIED BY

MUSSENS LIMITED, - Montreal and Winnipeg

H & E PATENT BALL BEARING LIFTING JACKS

for Railway Work, Contractors' and Builders' Use



These Jacks are built of the best grades of malleable iron and steel, and for speed, convenience or durability are unequalled.



Made in plain and foot lift styles, fully guaranteed.

Manufactured by

H & E Lifting Jack Company
WATERVILLE, QUE.

Stock carried by F. H. HOPKINS & CO.
Montreal

CUT GEARS
THEORETICALLY CORRECT
IN
RAWHIDE OR METAL

ROBERT GARDNER & SON LTD
Nazareth St. ~ MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.

Thor

PISTON AIR DRILLS



Sold in Canada by
H. W. PETRIE, Limited
Toronto
Montreal
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The Drill with CORLISS VALVE MOTION
30% greater efficiency guaranteed.

Independent Pneumatic Tool Company

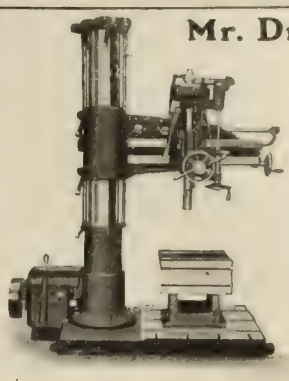
Chicago New York Pittsburg San Francisco

A REAL MONEY SAVER.

SIMPLE CONSTRUCTION.

READILY UNDERSTOOD.

Mr. Drill User:—



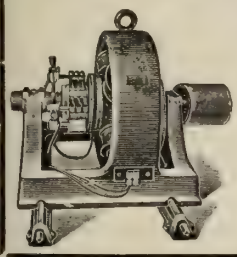
If you expect your employees to handle your drilling requirements in the shortest possible time, you must necessarily furnish them simple and rapid machines with which to do it, and because of this fact we bring to your attention the MUELLER Radial Drill because it is by far the simplest Radial Drill on the market. Ask any operator who has had experience on a MUELLER Radial Drill what he thinks of our machine and he will tell you without a moment's hesitation, that it is the easiest Radial Drill he ever operated, *and it does the work rapidly and accurately, don't forget that.*

The Mueller Machine Tool Co.
Cincinnati, Ohio, U.S.A.
Radial Drill Specialists

ACCURATE IN EVERY SENSE OF THE WORD.

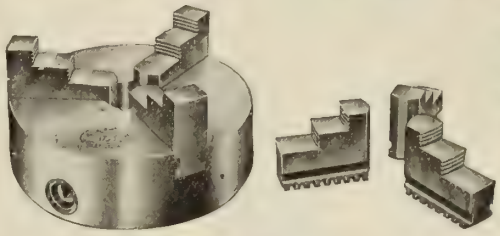
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IN YOUR FACTORY. WRITE

TORONTO & HAMILTON ELECTRIC CO.



MANUFACTURERS OF
Dynamos
for Light and Power
AND ALL
ELECTRICAL APPARATUS

UNION CHUCKS

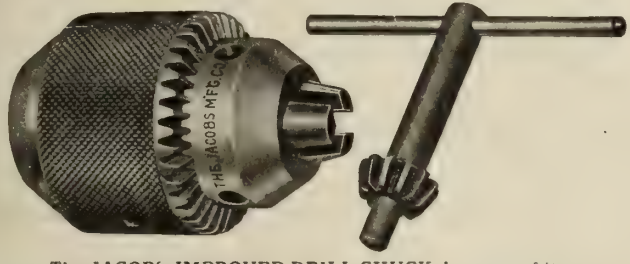


This Chuck has solid body and socket pinions. The scroll and pinions are made of a high-grade steel, which will stand wear and strains and insure accur

Union Geared Scroll Chuck, No. 153,

Union Manufacturing Co.
26 Cortlandt Street, New York NEW BRITAIN, Conn., U.S.A.
MAKERS OF A COMPLETE LINE OF CHUCKS

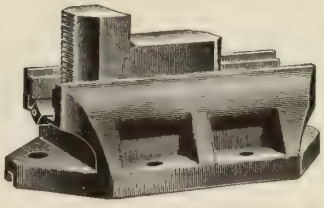
IT HAS MADE GOOD



The JACOBS IMPROVED DRILL CHUCK, because of its superior quality, "HAS MADE GOOD." The fact that our Chuck is the only Drill Chuck now purchased by many of the "UP-TO-DATE" manufacturers, is the strongest evidence of the superior quality of the JACOBS IMPROVED DRILL CHUCK, and explains why "IT HAS MADE GOOD."

SEND FOR CATALOG "C."

The Jacobs Manufacturing Company, - Hartford, Conn.

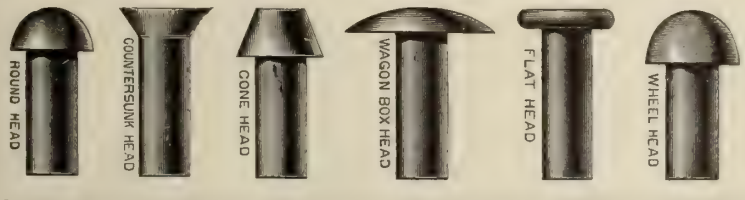


New Face Plate Jaws

with broad base ribbed to the body and unusually strong support without excessive weight. Can be used interchangeably on different face plates. Steel keys and square head bolts furnished. For strength, convenience and power you ought to try them. Write for circular.

We also manufacture ALL STEEL chucks, two-jaw chucks, etc.

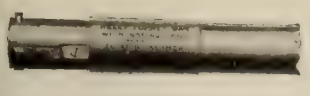
THE S. E. HORTON MACHINE CO.
WINDSOR LOCKS, CONN.



We manufacture Rivets of every description, ½ inch dia. and smaller.

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

Type B.—Turret 1" to 5½"



Adjustable, Replaceable, H. S. Blades

Charles Neat & Co., Agents
112 Queen Victoria St., London, England

THE KELLY REAMER

In BRONZE, ALUMINUM or STEEL TUBING they deliver plug gauge **size** and **finish**, and **continue** to do so. **Cylinders**, etc.—still easier. Big Mf'rs. use them. May we help **you**? Catalog?

THE KELLY REAMER CO., Cleveland, U.S.A.



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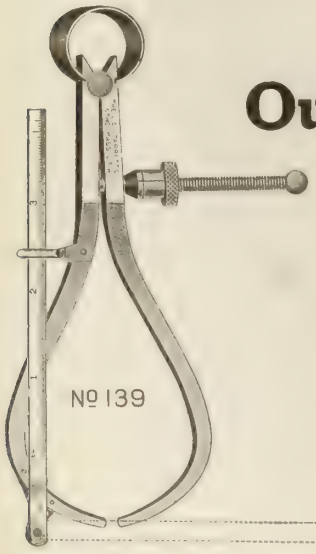
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This is one of the many fine tools we make. Get the Starrett 274-page catalogue. There is much information in it, which will be useful to you.

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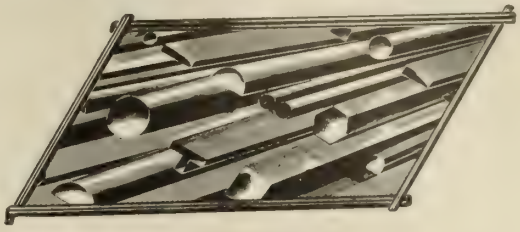
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Union Drawn Steel Co., Ltd.

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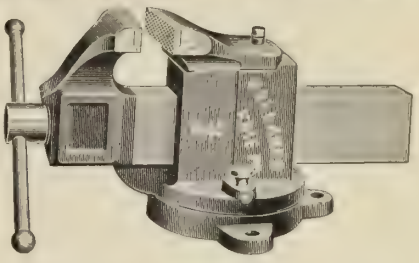
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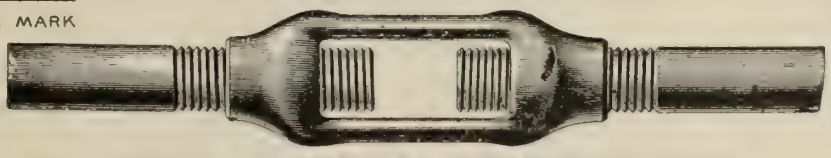
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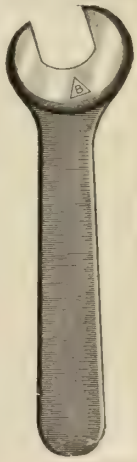
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INEXCUSABLE

It is not necessary to have hot boxes or to be rebabbitting bearings every few months. The following letter is merely one among thousands. Why not insist upon having Magnolia: it will show a big saving all along the line.

Philadelphia, Pa., Jan. 2nd, 1911.

Dear Sirs:

I will tell you about the use I have put Magnolia to. I poured three bearings on Jack Shaft that were always hot and could not lay your hand on. I put Magnolia in, and the bearings are now running fine and are about 100 degrees warm—there was White Brass in them before. I poured a top bearing block on a 300 H.P. Corliss Engine that could never be kept cool: no more trouble. This was done five months ago. Four months I ago poured a main bearing on a 250 H.P. Griene Engine top, bottom and quarter blocks, started the engine up, it never got hot: Engine runs twenty-three hours a day. I had trouble with Motor bearings; had to fix them every couple of months, they had white brass in before, changed them all to Magnolia, have not had any trouble since. This was one year ago. I have used it on Crank pin bearings and find it fine. I hope this is good news for you.

Yours truly,

CHAS. E. REBER,
Foreman Machine Shop and Repairs, Camden Coke Co., Camden, N.Y.



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LET GRAVITY DO YOUR WORK. THE MATHEWS GRAVITY CARRIER CO. ORIGINATED CONVEYING BY MEANS OF THE STEEL BALL BEARING ROLLERS AND STRAIGHT LIFT ELEVATORS.

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Systems designed without expense.

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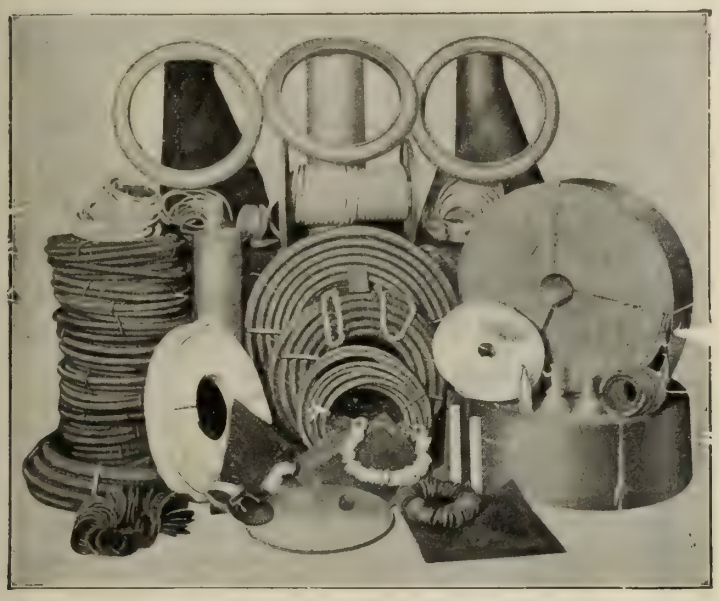
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Canadian Mathews Gravity Carrier Company, 312 Stair Building, Toronto

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Make your power transmission an ***asset*** instead of a ***liability***—a money-saver instead of a power-waster. Belt your machinery with

GOODYEAR

Imperial

High-Speed Friction Surface

Belts

"The Belt That Clings"

Built the famous Goodyear way, for high-speed pulleys where great tensile strength is demanded.

The Imperial has the cling of rubber and the endurance of many plies of hard-twist, long-fibre ***cotton fabric,*** rubberized, cured and vulcanized into one solid, enduring piece.

Earns Cost---Costs Less

The Imperial Belt is a power saver. It earns its cost by turning into increased production the power and the time lost by slippery leather belting. And it costs less.

Wears Longest Without Stretching

Most economical because it wears longest. First, because it doesn't slip. Secondly, because it is made by a process that abolishes ***internal friction.*** This soon wears the life out of best leather belting and is caused by internal ***grinding*** as the belt bends and whizzes around small high speed pulleys.

Instead of a few plies of coarse fabric, we build up the Imperial with many plies of fine fabric. After the ***stretch has all been taken out,*** rubber is forced through and all threads are separated from each other. Thus they can't rub and chew themselves, and the cause of internal friction is eliminated.

These belts are built to suit the purchaser. Let us quote prices on this most durable and economical high-speed, friction-surface, wear-resisting belting.

We also make other rubber products—Tires, Hose for all purposes, Sheet Rubber Packing, etc. Throughout, you get the same high quality materials, skillful workmanship and years of experience that have built such famous service into products of the Goodyear Tire & Rubber Co., Akron, Ohio, U.S.A. Write us at once.

The Goodyear Tire & Rubber Company of Canada, Ltd.

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BRANCHES: Montreal—Winnipeg—St. John, N.B.—Vancouver—Calgary

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Machine Cut GEARS



OUR SHOP IS SPECIALLY EQUIPPED FOR THE PRODUCTION OF ACCURATE SPUR AND BEVEL GEARS AT REASONABLE PRICES.

Write for Quotations.

Hamilton Gear & Machine Co.

Cor. Concord and Van Horne Aves.

TORONTO

Gem Shafting Lightens Labor

It enables you to take the tool to the work, instead of carting the work to the tool. Our Portable Emery Grinder is a high class general utility tool of wide range. It is *useful, practical* and *convenient.*

Write for catalog and remember—the *Gem guarantee is binding.*



GEM GUARANTEE GOOD

The Gem Oiler

is an economical oiler

It has a patent cleaning device that saves time and oil. It is exceptionally strong, machine made and interchangeable in all parts. Its durability is guaranteed. Made for all purposes.

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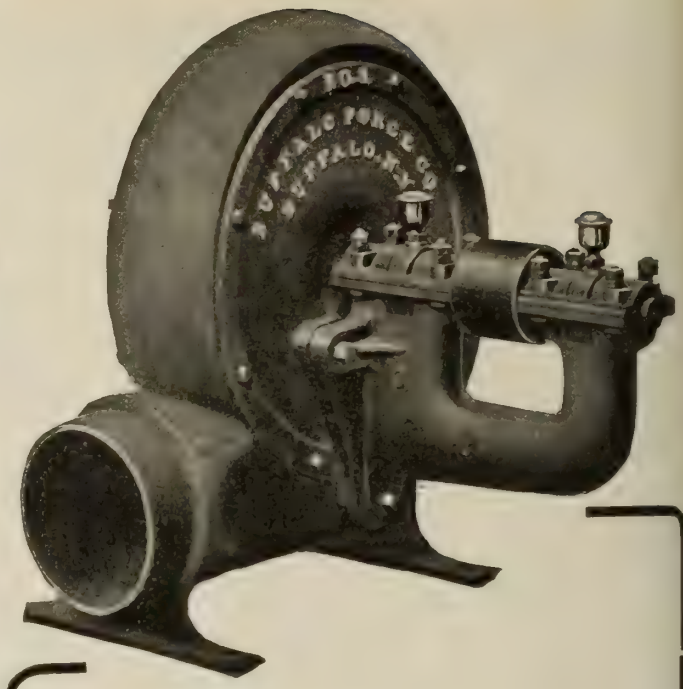


Gem Manufacturing Co.

3257 Spruce Street

Pittsburg, Pa. U.S.A.

English Agents—A. A. Jones, Pollard & Shipman Co., Ltd., Church Gate, Leicester, England.



Buffalo "B" Volume Exhausters

have a decided advantage over the usual type in the solid, one-piece peripheral shell.

Not only is this construction very rugged and strong, but the absence of joints under pressure in the shell prevents leakage of air and waste of power. The blast wheel is strongly built, accurately balanced, and, together with the extra long oil-ring bearings insures smooth, easy and quiet operation.

BUFFALO EXHAUSTERS are especially adapted for handling dust and refuse from emery and buffing wheels and tumbling barrels; and smoke, gases and fumes generally. You can always depend on efficient, reliable operation.

A wide range of sizes and capacities make it easy for you to select just the one for your requirements. Ask for catalog 178-LD and prices.

Canadian Buffalo Forge Co.

LIMITED

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RENOLD PATENT SILENT CHAINS

What Users Think

Montreal, Feb. 8, 1909

Messrs. Jones & Glassco, Montreal.

RE RENOLD SILENT CHAIN DRIVE.

GENTLEMEN,—In reply to your inquiry of Jan. 30th, I may say that the Renold Silent Chain Drives we have installed are giving every satisfaction.

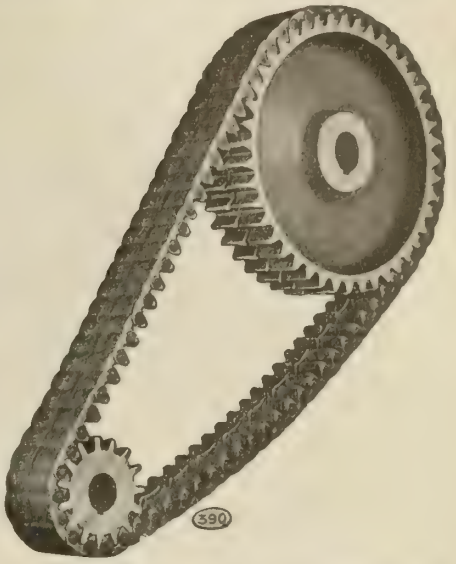
Our first drive was installed to replace a 12 in. belt which was giving us trouble on account of short centres: this chain has run continuously for four years without the slightest trouble.

Our second drive was installed on a mixing machine doing heavy duty and which had previously broken up two sets of spur gearing, this chain has run over three years with no sign of wear yet.

Our third drive was installed on a calendering machine after breaking two sets of helical gears, and this has been so successful that we are now installing two more similar drives.

I would be perfectly willing to make an appointment with any person genuinely interested and show him the drive in operation.

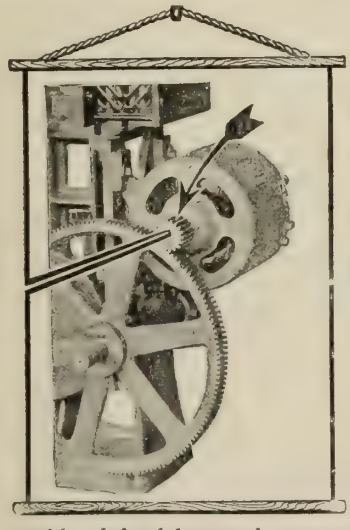
The above comes from one of the largest manufacturers in Montreal and is signed by the Mechanical Superintendent. Up to the present (1911) these drives have not received repairs of any kind.



Write for Catalogue

So satisfactory has their experience been that they are ordering (for a new extension) Renold Chain Drives throughout.

Jones & Glassco Sole Canadian Agents **Montreal**



"You must not neglect Vibration and Silence in Gear Drives."

That is about the way a college professor would talk to you about noisy gears. An experienced shop manager would add that outside of the delays and expense for renewing gears that have stripped because of vibration, the noise of high speed metal to metal gears is also expensive in misunderstandings and in creating bad feeling among the workmen.

If you have doubts, put one New Process Pinion where the noise and vibration are worst. We know that the results will make you want more of these noiseless pinions. Ask for our new catalog.

40

The NEW PROCESS OFFICE & WORKS — N.P.R.H. — RAW HIDE CO. SYRACUSE, N.Y.



A

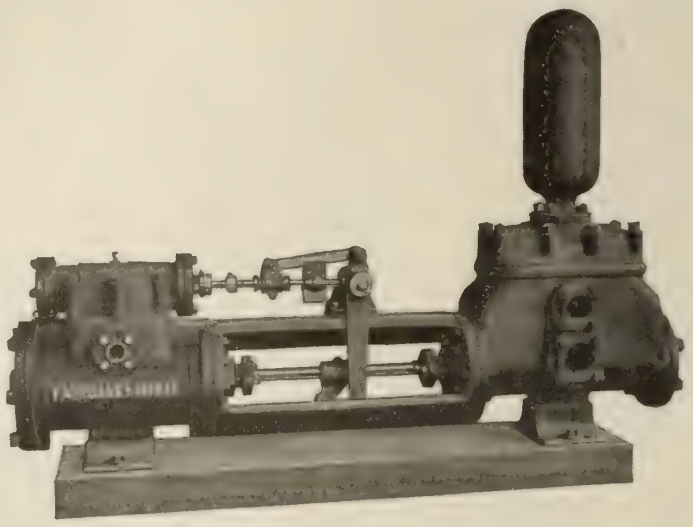
BABBITT

That Gives Satisfaction

Tallman's Reputation is in the Goods.

Tallman Brass & Metal Co.
HAMILTON, ONT.

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PUMPS

The superior excellence and splendid results shown by

"FAIRBANKS-MORSE"

pumping machinery are largely due to the fact that for many years we have manufactured Hydraulic Machinery of all descriptions. We are therefore able to build pumps which are properly designed and adapted to every-day use. This is of the greatest importance in a first-class pump, for the usefulness of an engine may be lost if the pumping machine is badly designed.

You will get all these important features when you purchase a "FAIRBANKS-MORSE" pump.

Let us solve your pump problems.

THE CANADIAN FAIRBANKS-MORSE CO., Limited

Fairbanks Standard Scales—Fairbanks-Morse Gas Engines
Safes and Vaults

Montreal Toronto Winnipeg Vancouver Calgary St. John, N.B. Saskatoon Ottawa

The Collingwood Shipbuilding and Engineering Co., Ltd.

By Bellfield (J.H.W.)

Being an Illustrated Description of the Plant and Products of One of Canada's Leading Shipbuilding and Marine Engineering Establishments, and Serving to Show The Ample Provision Made for the Furnishing, Upkeep and Development of the Marine Transportation Interests of This Dominion.

THE Collingwood Shipbuilding & Engineering Company's plant and property covers an area of about 40 acres, and embraces 2,000 feet of water front. In addition to the building of steel and wooden vessels of every type and size and their machinery equipment, the most up-to-date appliances and facilities are available for rapid, efficient repair work, by day or night.

Capacity of Plant.

There are two dry docks. No. 1 is 525 feet long by 78 feet wide, while No 2 is 450 feet long by 105 feet wide; the depth of water in each being 16 feet 6 inches over the sills. Four fairly large vessels can be laid down at once. Thus, on the east side of No. 1 dry dock, there is a 500-foot building berth served by overhead electric traveler, running on a gantry; while on the west side there is a 460-foot building berth served by locomotive crane and spar derrick booms. Again, on the east side of No. 2 dock is located a 400-foot berth, served by spar derrick booms and crane. On the west side of this dock, the largest ships are built, the berth being 600 feet long, and served by electric traveler on a gantry, similar to that on the east side of No. 1. Both gantries were built by the company themselves, as were also the overhead travelers, with the exception of motors, controllers, and other electrical details. The capacity of the travelers is nominally 20 tons, although they have often lifted considerably heavier loads.

The legs, or columns of the gantry, on the side next the dock, are of light lattice work construction, carrying a single rail on top. On the other side of the building berth, the columns are in pairs, and support two rails, so that the traveler runs on three of these, as may be seen in the illustration showing two scows ready for launching. This cut is introduced chiefly because it serves admirably to demonstrate the method of launching adopted, not only for scows but for all ships built in this yard. The overhead traveler is fitted, at its outer foot, with a jib, by means of which the outer running rail is removed piecemeal, together with the supporting columns. The vessels are then side-launched into the dock.

Both docks are closed by massive wooden gates, fitted with the usual sluices. The gate of No. 2 dock, is probably the largest wooden gate in Canada, its dimensions being 97 feet 6 inches long at the top, 87 feet 6 inches long at the bottom, and 16 feet thick at the centre.

Ship Construction Equipment.

Adjacent to No. 1 building slip is the punch shed, the equipment of which includes shears, punches, and radial drills by Bertram, MacGregor-Gourlay, Long and Allstater, and a 22-foot edge planer, by the Hilles & Jones Co., Wilmington, Del. Here all ship plates are sheared to size and punched, after being marked from the wooden templates prepared in the mold loft, which is located above the punch shed. This building is 220 feet long by 50 feet wide.

At the end of No. 1 slip are located the rolls for bending and flanging ship plates. These are of massive construction, and consist of three rolls, 18 inches diameter by 18 feet long, driven through a positive clutch by a two-cylinder 9 by 12-inch steam engine. The top roll is raised or lowered, to suit different thickness of plate, by means of vertical screws operating through bevel gears by friction drive from the engine. For



SHIPYARD, DRYDOCKS AND TOWN OF COLLINGWOOD FROM THE HARBOR

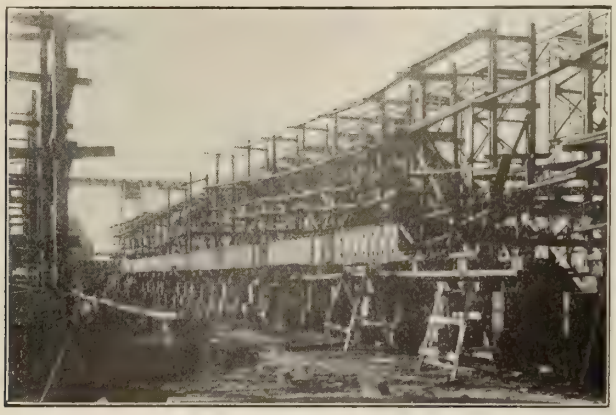
flanging plates the lower back roll is provided with a slot. The rolls were built by Wickes Bros., Saginaw, Mich.

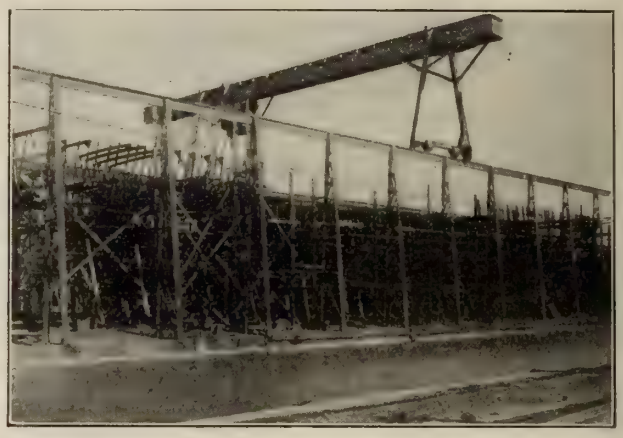
Near the south end of No. 1 building berth, there is located a stationary 7-foot gap riveter for riveting ship frames; this is operated by steam, and handles more rivets per hour than is possible with a hydraulic riveter.

To the east of the punch shed is the stock yard, where plates, channels, angles, etc., are stored. When the weather permits, a good deal of marking-off is done here, so as to conserve space in the punch shed. The yard is served by an electric traveling crane.

All plates intended for salt water trading vessels, are first pickled in a tank containing dilute muriatic acid, in order to remove the blue scale caused by rolling. It is a well-known fact that salt water rapidly dislodges paint, no matter how carefully applied to a plate not previously pickled.

The blacksmith's shop, covering a space 120 feet by 50 feet, and situated on the east side of the stock yard, is equipped with eight fires and a 2,500 pounds steam hammer. An Ajax rivet making machine is kept busy producing ship rivets. Here are also located the furnace and large slab where frames, angles, etc., are bent to the required curves and other shapes. Heavy forging, such as tail-shafts, connecting rods, etc., are purchased from forges making a specialty of that class of work. This of course is usual practice with marine engine builders. North of the blacksmith's shop, is a small boiler and dry kiln; the latter is used for drying timber, while the boiler supplies steam to the gap riveter and also to the engine driving the plate rolls,—already mentioned. A two-storey wooden building 125 feet long by 30 feet wide, is utilized on its upper floor as a patternshop, and at first glance on entering, we were surprised to note the entire absence of wood-working machinery. Enquiry brought the information, however, that





Canadian Government S.S. "Estevan" under construction at the Collingwood Shipyard.



No. 2 Dry Dock Gate at the Collingwood Shipyard.



Hopper Barges, 130' x 3'-6" x 10' deep, built for the Owen Sound Dredging and Construction Co., at Collingwood.



Mold Loft, the Collingwood Shipbuilding Co.



Punch Shed, The Collingwood Shipbuilding Co.

the plant of the joiner's shop on the lower floor did service for the pattern-makers. Very few joiners are now employed on the plant,—in fact the joiner shop is practically idle, owing to the interior wood work and decoration on



Vessels in No. 1 Drydock and under construction, The Collingwood Shipbuilding Co.



Launch of the Ontario & Quebec Navigation Co. Steamer "Geronia," at the Collingwood Shipyard.

all vessels built here having been transferred to the Brynes Mfg. Co., Collingwood. This concern is controlled by the C.S.B. Co.

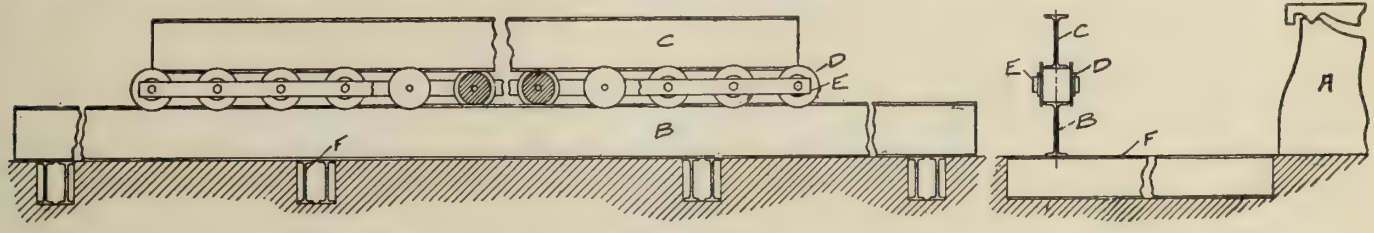
The Power House.

Situated halfway between the two dry docks is the power house, a large new brick building with steel roof trusses. The floor space, 100 feet long by 45 feet wide, affords ample space for additional equipment in the future. At present, the power is furnished by a horizontal tandem compound Corliss engine built by the John Inglis Co., Toronto. The cylinders are 18 and 34 inches diameter by 36 inches stroke. The engine exhausts to a Northey independent pump condenser situated in a chamber below the power house floor. The engine has a 14 foot pulley and drives a countershaft by means of a 32 inch belt. From the countershaft two Canadian General Electric d.c. generators are driven, each having a nominal capacity of 85 k.w. These are at present considerably overloaded and it is intended to duplicate them in the near future and instal another engine.

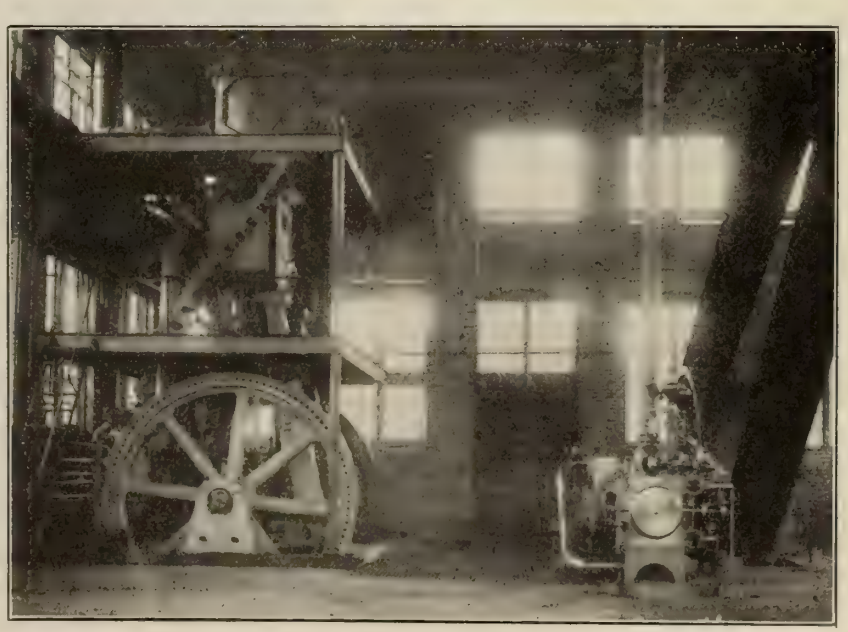
Perhaps the most conspicuous feature in the power house is the air compressor. As in every other shipbuilding yard, a very large number of air-motors, and chipping, riveting and caulking hammers are used. To supply air for these, the Collingwood Shipbuilding Co. designed and built the compressor seen on the left in our illustration of the power house. As will be noticed, the machine is of the vertical type and presents very much the same appearance as a 2-crank compound marine engine with the link motion removed, and two fly-wheels and governor added. The diameters of the steam cylinders are 18 and 36 inches, while the compressor cylinders, placed above, are 18 and 31 inches diameter. The common stroke is 36 inches. Each of the two crossheads drives a pump, one being the jet condenser air pump. The other supplies the condenser injection water and also circulates the cooling water through the jackets of the compressor cylinders.

The air, of course, is compressed in two stages, and on its way from the low pressure to the high pressure cylinder, passes through the intercooler seen against the wall behind the steam cylinders. The capacity of the compressor is 1,200 cubic feet of free air per minute. The Corliss engine and compressor are painted white and have as a consequence a clean and well cared for appearance. Steam is supplied from the pump and boiler house, situated a few yards away at the entrance to No. 1 dry dock. Here, are two Scotch dry-back boilers working at 130 lbs. pressure, one of them being 11 and the other 8 feet 6 inches diameter. Additional boilers will be installed when the second engine is put down in the power house.

The pump for emptying the docks is



Planer Extension Rig in Machine Shop of The Collingwood Shipbuilding Co.



Air Compressor and Horz. Corliss Engine, New Power House, Collingwood Shipbuilding Co.

located in a room adjacent to the boiler house. It is of the centrifugal type and has two 30-inch suction pipes connected to a main leading from each dock; the discharge being delivered into the lake through a 40-inch pipe. The pump, driven at 160 r.p.m. by a direct connected inverted vertical engine with cylinder 22 inches diameter by 24 inches stroke, is capable of emptying either dock in about an hour and a half. Two small (12-inch) centrifugal pumps serve to keep down any water that may drain in thereafter, and are run for half an hour or so when required.



Machine and Erecting Shop, Collingwood Shipbuilding Co.

The Boiler and Machine Shops.

The boiler shop is a well-lighted building of three bays. It is 80 feet long by 120 feet wide. Each of the two sides bays has a gallery above; that on the north side carrying the heating and ventilating apparatus supplied by the Buffalo Forge Co., while the other is used for laying out light plate work. The main bay is served by a 3-motor electric traveler of 50 tons capacity. This was built by the Collingwood Shipbuilding Co., as were also the cranes in the machine shop and foundry. The motors, controllers, etc., were purchased from and are of the Northern Electric Co.'s make. When the shops were built, the columns and crane runways were designed for a crane load of 100 tons with a view to increased capacity if necessary in the future.

The boiler shop forms a good example of what can be done by systematic management in the way of handling heavy work in a small space. To an outsider two large Scotch boilers seem to comfortably fill the main bay! Yet the men do not seem inconvenienced at all; work goes on steadily all day and the boilers are always out on time. The vertical boiler plate rolls were built by Wickes Bros., Saginaw, Mich., and will take in a plate 12 feet wide. Driven by a two-cylinder horizontal steam engine, they are capable of bending plates up to 2 inches thickness.

The hydraulic riveter has a gap of 10 feet 6 inches and can has a gap of 10 feet 6 inches and can close rivets with a force of 160 tons,—the working pressure being 2,000 pounds per square inch. With the exception of the riveting head, which was purchased from the Chambersburg Engineering Co., Chambersburg, Pa., the riveter together with the accumulator which serves it, was built by the Collingwood Shipbuilding Co. This latter has two 9-inch rams, and is loaded by a solid monolith of concrete, instead of the usual tank filled with scrap iron. The pumps are of the 3-throw belt driven type made by the Northey Mfg. Co.

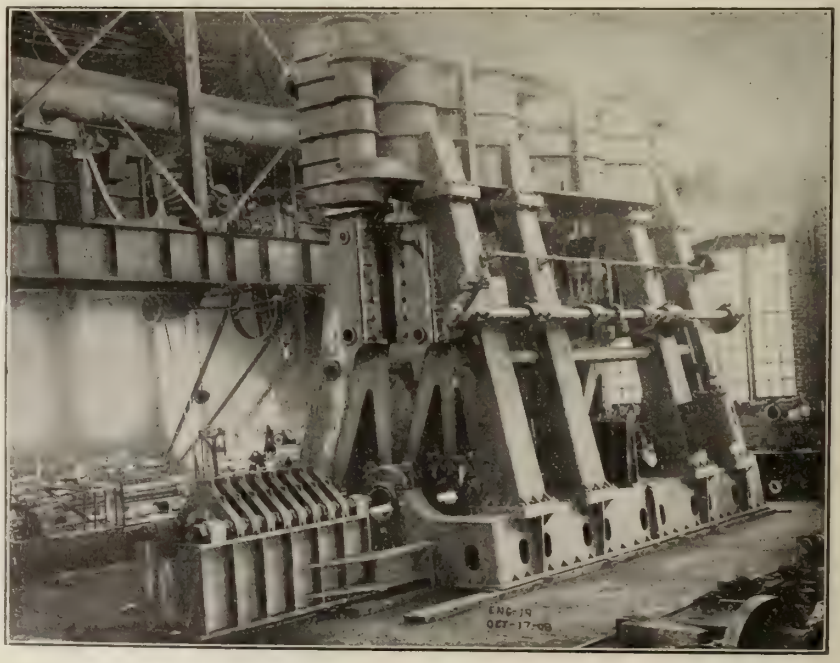
The boiler is suspended for riveting from an overhead crane operated by hydraulic pressure. The carriage has longitudinal and traverse motion, and is controlled from the floor by suitable levers.

The principal machine tools in the boiler shop are a 19ft. plate edge planer and a large radial drill both by the John Bertram & Sons' Co. At present all flanging is done by hand, but the old power house, which lies alongside the boiler shop, is about to be converted into a flanging shop and will be fully equipped with furnace and hydraulic flanging press.

The Foundry and Machine Shop.

The foundry and machine shop are under one roof, in a building cut off from the rest of the plant by the Grand Trunk tracks. Each section is 80 feet long by 118 feet wide and is served by a 50-ton electric traveler similar to that already described in connection with the boiler shop.

The foundry presents no special features, except perhaps that it is rather better lighted than usual. There are two gallerys, one for pattern storage and the other forming the cupola charging platform, in addition to being used for storage of sea coal, coke, etc. The cupola is a No. 5 Whiting, and blast is supplied by a Buffalo Forge Co. No. 10 fan driven by motor. The two coke-



6,000 I.H.P. Triple Expansion Engine and Thrust Block, S.S. "Hamonic," built by The Collingwood Shipbuilding Co.

fired core ovens are located below the south gallery, close to the core-makers' benches. Molds are made in green sand, dry sand or loam, according to the size and nature of the job. A few brass castings are made, the brass being melted in the usual manner, in crucibles over a pit fire burning coke. The output of grey iron castings is about 50 tons per week with the foundry busy.

The machine shop is divided off from the foundry by a partition and sliding doors. These had not been completed at the time our photograph was taken. All the machines are painted white, while the shop columns and girders are a light grey, so that the shop presents a very bright, attractive appearance, concerning which, our illustration fails to do justice.

All planing is done on an open-sided planer made by the Detrick, Harvey Machine Co., Baltimore, Md. This has a table 16 feet long by 42 inches wide. Long articles, which have to be planed on the ends, such as engine columns, overhang the planer sideways to such an extent that there is a tendency for the table to tilt. This trouble has been overcome in the manner shown in the line cut. A is the planer, B and C are two 10-inch I-beams, the former being the length of the planer bed and the latter the length of the table. Between the two beams are cast-iron rollers D. These have a flange each side to keep them on the beams and are coupled together by side straps E. The I-beams, F, are 10 feet long, and are embedded in the floor. The beam B may be moved sideways along the beams F, to which it is bolted when in the desired position. The job to be planed is bolted to the planer table, and the overhanging end is bolted to the beam C. The top of C is slightly lower than the table, so that the work can be packed up square and true.

Arrangement of Machine Tools.

All the lighter machines are grouped under the two galleries and are served by chain blocks running on overhead rails. The heavy machines stand on each side of the main bay just far enough out from the galleries to allow the electric traveler to serve them. The heavy machinery on the north side of the shop, includes, besides the above mentioned planer, a 42-inch lathe with 18 feet bed, made by the London Machine Tool Co., Hamilton. This lathe handles pistons, cylinder and valve-chest covers, also tail and crank shafts, if not too big. Under this gallery are two 20-inch and one 18-inch engine lathe by Flather & Co., Nashua, N.H., and one 24-inch engine lathe by Betrams. There is also a double-headed bolt cutter by the Reliance Machine Co., Cleveland. The lathe, on which the heaviest work is done, was supplied by the American Tool Works Co., Cincinnati. A few years ago, its centres were raised and its face plate enlarged to swing 84 inches. Its bed is 25 feet long and will take a 24-foot shaft. A 16-inch slotter and a 6-foot radial drill, both by Bertrams, complete the list of heavy machines.

Under the south gallery, a 25-inch double shaper by Chas. Booth, Liverpool, is still doing good work though of distinctly old-fashioned design. Here also is located a group of six engine lathes, all by the Flather Co., and ranging from 14 inches to 24 inches swing. The two galleries are at present used for pattern storage purposes, but afford plenty of space for light machine tools whenever it may become necessary to increase the capacity of the shop.

The engines are erected and tested in the main bay of the shop. The bedplates on coming in from the foundry are placed on the floor and have the bearings bored by a 20-foot boring bar driven by an ordinary air-motor. They are then taken to the planer to have the facings for columns, etc., planed, after which erection of the columns takes place. The cylinders are first bored on the big lathe and are then transferred to the surface table to be marked off. They next pass to the planer after which they are set up on the engine to have the column bolts marked off. These bolt holes are then drilled at the Bertram radial drill. It will be noted that a considerable amount of heavy lifting is necessary, and the overhead traveler, in consequence, is kept busy.

In building cranks, the webs are first bored out and finished all over; then the crank pins are also finish-turned, and shrunk into the webs. The shafts are turned to a shrink fit on those parts fitting into the crank webs and rough turned elsewhere. After shrinking into the webs, dowel pins are fitted and a finishing cut taken in the lathe.

Work in Hand.

The firm is at present building a ship to the order of the Department of Marine and Fisheries, Ottawa, for lighthouse and buoy service along the Pacific coast. She is of open hearth steel, 215 feet long overall, 200 feet between perpendiculars, 38 feet beam and 17½ feet deep. She will be propelled by twin screws, driven by vertical triple expansion engines having cylinders 15, 25 and 42 inches diameter, by 26 inches stroke. Steam will be supplied by two Scotch boilers 14 feet in diameter by 11 feet long, working at 180 pounds pressure. The ship is being built to the highest classification at Lloyds and to Canadian Government special inspection. The hull, machinery, and boilers were all designed by the company. The ship will be named "Estevan," and will leave Collingwood next spring on her long voyage round Cape Horn to Victoria, B.C.

Number of Men Employed.

There are two drawing offices, one devoted to hull designing and the other to engine and boiler work. Fifteen draughtsmen are employed and the accounting department keeps busy a clerical staff of ten. The shops and yard gives employment to about 700 men, the number of course varying with the amount of work on hand.

S.S. Emperor.

The bulk freighter "Emperor," which recently came to grief in the Soo canal, was built by the Collingwood Co. She is the largest Canadian boat on the Great Lakes, and is owned by the Inland Lines, Ltd, Midland, Ont. Her principal dimensions are, length overall 525 feet; length between perpendiculars, 505 feet; beam, 56 feet; depth, 31 feet. Her single screw is driven by a 3-crank triple expansion engine having cylinders, 23, 38½, 63 inches diameter by 42 inches stroke. Steam is supplied by two Scotch marine boilers, 15 feet 6 inches diameter by 12 feet long. Each boiler has three furnaces and the working pressure is 180 pounds per square inch.

Officials of the Company.

President.—Captain Alexander MacDougal, Duluth.

Vice-Pres.—Thomas Long, Toronto.

Secretary-Treasurer.—Sandford Lindsay, Collingwood.

Directors.—P. M. Campbell, Collingwood; M. P. Byrnes, Collingwood; Simon Dyment, Barrie; H. B. Smith, Owen Sound.

General Manager.—Jas. M. Smith, Collingwood.

Our thanks are due to the last named gentleman for the facilities afforded us for collecting the material for this article on the occasion of a recent visit to Collingwood.

It has been found difficult to make large steel gears out of steel castings on account of the difficulty of getting a perfectly sound casting. One machine tool builder in the Middle West, has, therefore, abandoned the use of steel castings for large gears, and instead shrinks a forged steel ring onto a cast-iron gear body, much in the same way as tires are shrunk onto car wheel centers. Very satisfactory results are obtained in this way.

Some Features to be Noted in Efficient Shop Operation*

By E. T. Spidy **

The Writer of This Paper Occupies the Unique Position of Being the Youngest Member of the Western Railway Club to Read a Paper Before That Body, and It Speaks Much for the Evident Interest Being Taken in Present Day Questions Relative to Increased Efficiency in Manufacturing by the Rising Generation That Such a High Quality and Instructive Article Has Been Made Available.

IN this paper, I propose to bring out some of the many points that go to make an efficiently operated shop, and to make a few notes on each. Not so very long ago, shop efficiency was considered part of the foreman's duties, and, mainly due to the demand for increased output, the "Shop Engineer" is now a recognized necessity to relieve him of that part of his former work, relating to machinery upkeep, tools and general improvements. The foreman is the man on whom the responsibility of the individual shop rests; he is the "hub," as it were, and the smooth working of all the minor wheels deuends on his ability as an organizer, and on the amount of co-operative effort he receives.

Shop Organization Specialists.

The first point to which I would draw attention, is the "Shop Organization." By this, I mean the plan of control by means of which the whole work of a plant is divided and sub-divided among foremen and charge hands, so that the responsibility for any particular detail can be instantly located. The organization of any shop being governed by its size, the class of work handled, and the conditions met with, peculiar to itself, obviously no definite rules can be laid down. A shop may be organized to spesialize as much as possible, or specializing might be impracticable. For example, take a locomotive erecting shop; in one shop we see that the gang boss has the entire erecting of an engine to look after, from stripping to finishing, while in another shop we see the charge-hand concerned with the general erecting alone. A special gang strips the engine, another gang is responsible for shoe and wedge work, another for motion, and so on; the whole work being in the hands of men who are specialists at their particular work. In a small shop, the amount of specializing that can be done on these lines is minimized, but even here, we see that a certain man always does the same job on an engine, and is, in consequence, a specialist.

Shop Organization—Function of Foreman.

In manufacturing shops operated on a modern piece-work or bonus system, the introduction of functional foremen has proved successful. These latter are additional, and are responsible for certain functions of the shop that can be better handled by men who are experts, than by the regular foremen. In a piecework shop, specializing becomes a necessity, and enables the keeping of more accurate records. By dividing the work thus, each man becomes independent of the rest, for he alone gets all the benefit of his increased efforts, whereas, when the whole gang work together, the slow men have to be carried, and this causes oftentimes dissatisfaction.

Shop Organization—Standardization.

One point to which I would make special reference, is that of "standardization." Just how far this should be carried in a shop is hard to say, yet, being one of the items that reduces cost, it is well worth considering. Hand and machine tools should be standardized as far as possible, as should also be the method of dealing with them. All tools required should be handed to the men from a distributing room, situated as near the centre of the shop as possible Machine tools should be forged in the smith-shop and taken to the tool room where they are ground ready for hardening. The tool room itself should be equipped with a hardening furnace for machine tools, and an oven for hardening taps, dies, reamers, etc., that require careful treatment.

Tools, such as taps, reamers, jigs, etc., should all be checked against the man receiving same. A system of giving each man so many checks when he enters the service and making him deliver one check for each tool received, keeps a tab on all tools, and by placing that check where the tool came from, location is simplified, should the tool be wanted by anyone else. All tools should be called in periodically, and their condition observed, so as to keep the stock up-to-date.

Pneumatic tools should be brought in regularly for inspection and oiling, and suspended in benzine, which will tend to clean them.

Machine tools should, as previously stated, be ground in the tool department by a man kept especially for the job. Lathe tools have a definite shape, and all angles of lip and clearance are fixed to a standard. For roughing tools, the clearance angle, or angle behind the cutting edge, is 6 degrees, although some English standards reduce on this a little.

These angles are accepted standards, and represent results obtained by experiment and modern practice on heavy duty machines. Boring mills do not take tools of like height as lathes, and the back and side slopes are usually reduced a few degrees. Planer tools, again, reduce on the clearance angle, and have two degrees only. This gives a stiffness behind the point, supports it on entering the metal, and reduces the tendency to chatter.

All tools used on machines, whether roughing, finishing, knife or parting tools, can be handled better by a separate department such as the tool room, than by individual workmen. The reason for the many shapes of tools found in a shop, unsystematically handled, is that instead of being the result of each man's "experience," it is merely the result of "custom," the difference being quite obvious. The same remark applies to the tool smith. It used to be bad policy to fall out with the man who hardened your tools, and anybody, who has ever worked under these conditions, knows why. As the smith becomes fully acquainted with the methods of treating the many different kinds of steel now in use, it is reasonable to expect that if he does his work in bunches at a time, instead of one of this and one of that, while somebody waits, he will turn out more and better work, and get more satisfaction from it as well.

Driving wheel lathe tools, although all specially shaped, should, however, go through the same process in handling. Considerable saving is claimed at the Montreal Locomotive Works, on large finishing tools, by welding a piece of high-speed steel into a billet steel shank; the cost of such tools being small, compared with solid high-speed tools of the necessary heavy section, I might say that the same process was tried at the Canadian Pacific Railroad Shops in Montreal, but whether due to the hard tires, or otherwise, I understand the success met with was not convincing enough for its adoption as a standard. Some smaller special tools, however, are

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* Paper read before the Western Railway Club, October, 1911.

** Assistant to general locomotive foreman, C. P. Ry. shops, Winnipeg.

high-speed-steel tipped right along. High-speed steel for tools used only occasionally, represents capital tied up, and if you can use your odd ends to tip special tools, you are certainly getting better interest on your outlay.

While on the subject of machine tools, the question of standardization of tool steel comes up. This is a difficult matter to decide, especially as each steel-maker claims his is the best. No one wants inferior tool steel, therefore, they let us experiment with our own particular class of materials, and determine what suits best. Although it may be impossible to adopt a standard steel for all work, I believe it can be done so far that certain tool steels will be found better on certain classes of material. High-speed steel forms a large expenditure item that makes this very desirable.

Feeds for Drills.

Feeds for drills vary with the metal drilled. For medium cast iron, a basis for a high-speed drill might be .01 inch per revolution, per inch diameter of drill: this, however, can only be considered a guide. Records, made at the Master Mechanics' Convention, this year, in Atlantic City, show that feeds of one-tenth of an inch per revolution at 575 r.p.m. were obtained in cast iron billets with an 1¼ inch drill removing metal at the rate 70.55 cub. ins. per min. This of course is phenomenal and was made under ideal conditions.

Cutting speeds on lathes, boring mills, etc., have also increased, and tend to increase with each improvement in tool steels. It is impossible to do more than make an average statement of what speeds should be used on various metals, owing to the many variable elements to be considered. The size of the tool and the quality of the tool steel, the capacity of the machine, the material operated on, the depth of cut taken and the feed employed all influence the cutting speed.

It must be granted that there are certain combinations of these elements better suited to each job than others, but to determine the correct combination to remove a certain amount of stock in the most efficient manner, necessitates a detail study of the machine from a power standpoint, and also an intimate knowledge of each condition to be met. It is considered best practice to remove the necessary metal in one or two cuts, according to the amount to be removed, and to use the heaviest feed practicable in connection with available speeds. The size of the tool is determined in some degree by the machine, and in experimenting with tools up to 1¼ inches width, they should be figured to stand 30 minutes maximum cutting before showing signs of failure. Careful experiment will afford much information of the relations between these elements, and will give some accurate idea of what can be expected from each tool. Modern lathes, with 6 inches centres, require 5 h.p. to drive, while a 24 inches centre lathe needs 30 to 40 h.p. to keep going; the latter power being necessary with two tools in operation.

Stroke Machine Speeds.

Stroke machine speeds have risen in line with other machines. Modern high-speed planers have cutting speeds from 30 to 90 ft. per minute, with return speed of 200 ft. per minute. The development of electrical reversing gear is an indication of progress.

Milling machines are a great asset in a manufacturing shop, especially where much duplicate work is done. An average cutting speed is about 70 ft. per minute, but this, of course, is dependent on the stock being removed. Feeds vary from ½ to 20 inches or more per minute, dependent on the work also.

READER, WHAT DO YOU KNOW?

Among readers of Canadian Machinery there is a clearly defined sincerity of desire to know how each overcomes the daily tasks of the machine, pattern and blacksmith shops, the foundry and boiler shops. It is believed that your methods and devices, while good, may be improved, and thereby made more valuable if you publish them, so that other brains may work on them. We will provide the setting and pay you for the material. When your fellow tradesman puts the superstructure on your foundation, we pay him and pass the "kink" on to you, free. Get into the game.

Grinding machines are now an asset to railway shops, being almost indispensable. These machines handle work roughed-out in other machines, and finish same quickly and accurately. Grinding is, in reality, milling on a finer scale, and motion pins and shafts are made cheaper and better than on a lathe. A wheel 24 inches diam., running at 5,000 ft. per minute, gives good results. At the C.P.R. Montreal shops, new piston rods are rough turned in the lathe only; the body being ground to size, removing 1-32 inch of diameter, with a wheel running at 5,000 ft. per minute. The rod is rotated at 20 revs. per minute, while the traverse of the wheel is 38 inches per minute. This entirely dispenses with the rolling operation.

Reamers and Milling Cutters.

There is a large amount of taper reaming done in connection with locomotive work, but very little seems to have been done, so far, towards getting better tools than those which have been in use for many years. The straight fluted reamer may be all right for parallel holes, but for taper holes the spiral reamer is superior to all others, long or short. The straight fluted reamer has to take a cut its whole length at one time by a drag or scrape process. The cutting action here is weak, for the length of the shaving prevents little more than a scrape being taken. The eccentric fluted reamer has the advantage of not chattering, and is superior to the ordinary equal fluted reamer, but with a spiral reamer, we have a shearing action by means of which a cut is started at one point, and carried until it leaves the edge of the tool. Spiral reamers should be made left-handed, so that it has a tendency to draw itself from the hole, and not into the hole. This left-handed spiral will, also, by the same tendency, clear itself of the chips, and will not clog nearly so much as the straight fluted reamer. The benefit of the spiral reamer is also shown in the fact that the power, required to drive it, is much less than with the straight fluted type of the same size. If made of high-speed steel they will do better service still, although they are most costly to make: the saving, however, will warrant the expenditure easily.

Milling cutters come in the same class as reamers, therefore, a few words on their economic manufacture is in order. The practice of using inserted toothed milling cutters for the larger sizes, is almost universal. Billet steel makes an ideal centre, and the blades should be made from old high speed machine tools forged to proper dimensions and machined to fit the grooves in the body. These latter are cut at an angle to the axis so as to approximate the ideal as nearly as possible,—the ideal being, of course, the spiral. The blades are fitted and lightly caulked in place, then turned over the top to required diameter. They are afterwards removed and hardened, then replaced and ground.

This straight blade cutter, however, has a disadvantage (not met with in spiral milled cutters) which is rather difficult to overcome. It will be seen that the clearance lip in front of the cutting edge, touches the work at varying angles throughout the length of the blade, therefore, if the blade is set so that its centre has the correct clearance lip, one end will have excessive and the other a minus lip, resulting in a drag action at that end of the cutter. This also produces uneven strains, which not only tend to loosen the blades, but put

the whole cutter out of action just as soon as the weakest portion (where the scraping takes place) becomes dull. It is possible to set the blades back from the axis so that there is always a cutting lip, but excessive lip at the other end is thereby increased.

Little attention has been paid this feature until recently, and now, one company, at least, are milling the entire front face of the blades, which projects from the body. This obviates the evil entirely, and makes the tool the equivalent of a solid spiral milled cutter. The practice of making solid plain milling cutters entirely of billet steel is an economic one, and where the metal to be removed is of even character and not too hard, it is to be recommended, especially on new work of a straightforward nature. These tools are made precisely the same as any other cutters with spiral flutes, but are case-hardened as deeply as possible. Axle steel or any high carbon steel will make admirable cutters if properly case-hardened.

Shop Organization—Efficient Operation of Individual Machines.

Next in order comes the efficient operation of individual machnes. Machine speeds have gone up during the past few years, and the tendency is to go still higher. It is necessary to have a range of speeds on each machine suited to the class of work to be done. Take the case of drilling machines; since the advent of high-speed drills, the correct number of revs. per min. has increased on an average, 75 p.c. over the speed called for by carbon twist drills. Now, the extra high speed or flat twisted drill used on certain classes of work demands a speed 130 p.c. over the original speed for the same size of drill, therefore, unless drills are run at the proper speeds, they cannot work efficiently, so the value obtained is minimized. A machine, to drill holes from $\frac{1}{8}$ to $2\frac{1}{2}$ inches, needs a capacity from 50 to 500 r.p.m. High-speed drills less than $\frac{1}{8}$ inch diam., call for higher speeds than 500 r.p.m., but unless the machine is of modern design it is inadvisable to go above this, for the vibration set up not only racks the machine to pieces in a short time, but makes true holes difficult to obtain, and breaks many drills. Twist drills should never be used in cored holes, because flat drills, made from odd ends of high-speed tools, will do the work far better, and be much less expensive.

Railroad Shop Methods Standardization.

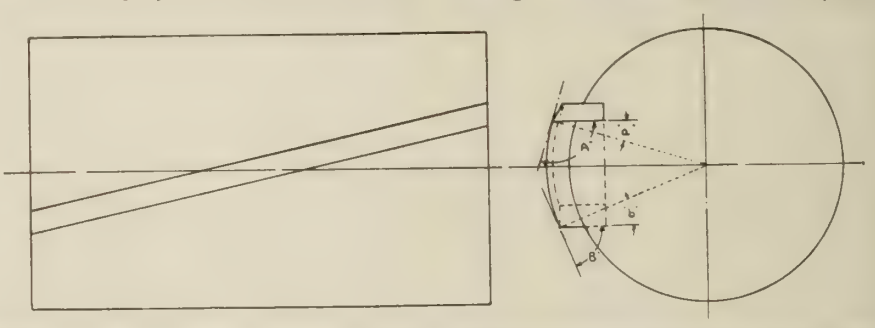
The standardization of shop methods has not been too seriously considered in railroad shops generally, until very recently. It becomes an essential feature in shops with piece work or bonus systems in vogue. There is, undoubtedly, a best method of doing a job, and it is possible to realize and maintain it. On new work, the standardization of methods can be accomplished without great difficulty, and even with repairs, much may be done in a like direction.

The cost of getting the necessary records for this purpose is more or less high, because it entails a scientific investigation of each move by the operator, and the conditions under which he works. Just as the scientist, who, in order to solve any complex problems, analizes each and every feature of the case very minutely, so must the same principle be applied to each shop operation, in order that details, insignificant in themselves, be brought to light for study as to essentials. If essential, then performance should be as efficient as possible. This investigation obviously necessitates a man trained in the work, it being beyond the capacity of the foreman to spend the time, or get the necessary information. The handling of material from shop to shop, and from machine to machine, is now brought down to a science. Locomotives coming in for repairs are ordered out by a certain date; in consequence, every required detail is scheduled to conform accordingly. This scheduling of work is comparable to that of train running. The dispatcher knows the location of all his trains and when due at the next point. He moves everything accordingly and secures continuous operation. On a like basis in our shops, similar and absolute control is obtained.

High Standard of Equipment Repair.

To have an efficiently operated shop, it is necessary to maintain a high standard of repair on every machine. Belts must not be neglected, and a system should be employed to enable the belt man to be located at all times. The class of hoist each man has at his command is of importance, and wherever practicable, individual hoist service is to be recommended. Jigs, labor saving devices, or ideas, should be encouraged, and advantage should be taken of the kinks put forward in our engineering journals to reduce shop expense.

In conclusion, I would point out that the foregoing is only the material side of the question of shop efficiency. It needs the co-operation of the whole staff to get results, and it has no place for a man who does not take a lively interest in every detail intended for the benefit of his shop. The co-operative effort of every workman is desirable, and the object in view, that of bringing the conditions affecting the shop to a point as unvarying as possible, whereby the greatest advantage may be taken of modern facilities and the abuse of same minimized. In short, to use the words of a well-known efficiency engineer, "Our object is to get the right job done on the right machine, in the right manner, by the right man, and at the right time." When we achieve this, we shall have an efficiently operated shop as far as the human element can make it.



Angles "A" and "B" show how angle between milled surface and front edge of cutter varies at each end of the blade. Angle "A" is actual clearance lip at one end. Angle "B" is the minus lip that causes scraping.

NEW TEN-WHEELERS FOR C. P. R.

The Montreal Locomotive Works are now building for the C.P.R. fourteen ten-wheel engines of the D4 class. They have 19x24 inch cylinders and 62-inch driving wheels, and the piston valves are operated by Walschaert valve gear. The boilers, equipped with the Vaughan-Horsey superheater, have a working pressure of 180 lbs. The engines will each weigh about 135,000 lbs., exclusive of tender, and they will be used on branch lines and for main line way-freight service. The C.P.R. are to build ten more of this class at their Angus shops, Montreal.

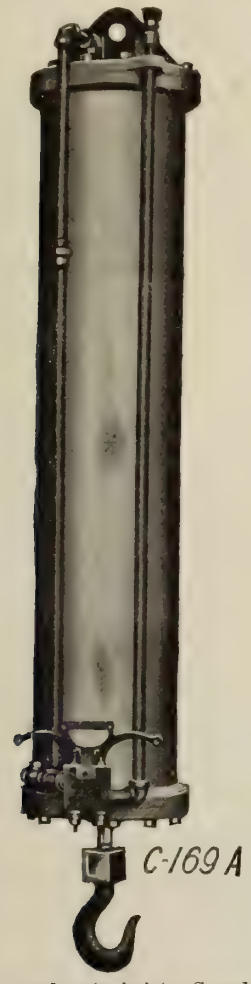
The consumption of aluminum throughout the world is increasing very rapidly according to a recent statement in the Daily Consular and Trade Reports. A German source is quoted as stating that in 1909 the amount consumed exceeded 34,000 tons—a marked increase over previous years.

CORRECTION.

The 500 h.p. electric motor driving the Canada Steel Co.'s rolling mill at Hamilton, Ont., was built by the Canadian Westinghouse Co., Hamilton, and not by the Can. Gen. Electric Co., as stated in the description of the mill which appeared in our November issue.

THE ALWAYS READY AIR HOIST.

IN industrial establishments of any size, the compressed air supply for general power purposes, may be said to have advanced its status from a mere convenience to that of an actual necessity, and works, pretending to business enterprise, without having a permanent and reliable supply of compressed air, are now the exception. Compressed air

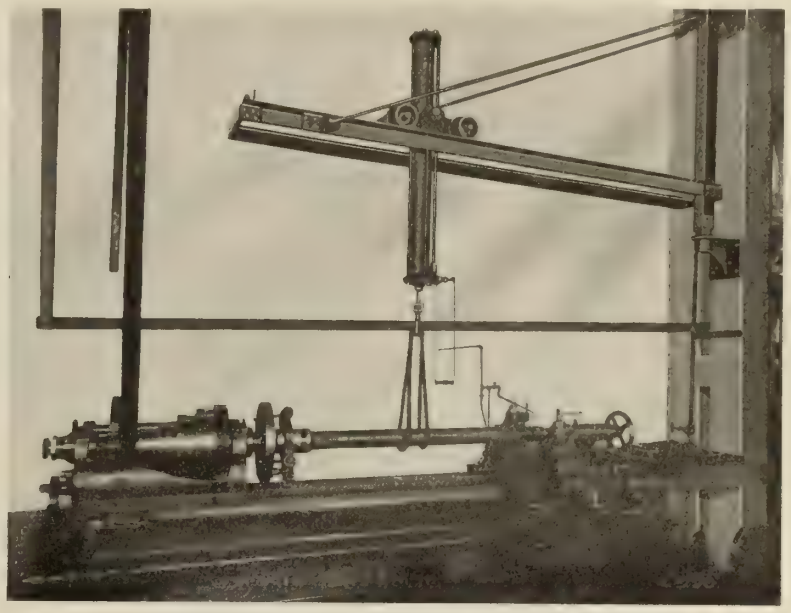


The always ready air hoist.—Canadian Rand Co.

has proven itself an excellent servant for light, widely separated and occasional services, and it shows perhaps at its best when used for hoisting purposes. A direct-acting single cylinder air hoist, in its instantaneous readiness, quickness and precision of action, is without a rival in its special field, while the geared motor hoist cannot be surpassed for control of the rate of lifting and lowering, besides giving absolute certainty of keeping the load suspended anywhere, as long as desired.

In the employment of compressed air for the driving of steadily operated tools or machines, there is one particular condition, generally imperative. It is necessary to have a continuously running compressor, because it is not practicable to store air in sufficient quantity to last any length of time. With capacity adapted to its regular load, and production and consumption of air going on regularly, and at approximately equal rates, the compressor, with its air storage capacity as usually provided, can only be reckoned as about a single minute ahead of the demand, therefore, if it should stop for that brief space of time, all the machinery operated by it may be expected to be out of commission almost directly. This one minute of margin, however, compares advantageously with the electric drive, in which there is not a single second of stand-by.

It really needs little, reckoned in horse power, for any single operation of hoisting, and the time taken is very brief when compared with the intervals of rest between; therefore, a small compressor running continuously may supply several air hoists, without recourse to excessive or expensive storage capacity In shops where the air supply is maintained for operating pneumatic tools and numerous other devices, so common in railroad shops, consumption of air by the hoists is scarcely appreciable. To raise one ton, five feet high in one minute, requires only one-half horse power, including liberal allowances for friction and other losses, and this half horse power may be supplied from a compressor with one-tenth of that capacity or less by allowing it to work right along through the generally occurring intervals between lifts.



The always ready air hoist.—Canadian Rand Co.

ELECTRICALLY OPERATED OVERHEAD TRAVELING CRANES.

THE electrically operated overhead travelling cranes described and illustrated herewith were supplied recently by Royce, Ltd., Manchester, England, for the boiler shop of David Rowan & Co., Clydebank, Scotland. As evidence of the satisfactory results obtained from their installation, a duplicate order has since been received.

Features of Interest.

The principal features of interest in these cranes are those tending to safety of operation and economy in current consumption. The structural steel work, steel shafting, cast-iron, etc., entering into the manufacture, are each figured for strength and fitness according to British Government rules, ensuring thereby reliability on a basis of test and experience over a wide range.

Regarding safety in handling the raised load, it may be pointed out that duplicate electrical solenoid brakes are fitted to the hoisting motion, each being capable of holding with ease the rated overload capacity of the crane. Both brakes act simultaneously when the current is switched on or off the hoisting motor circuit, and are immediately applied should there be failure of the current supply from any cause. In addition to the foregoing, special controllers are supplied, fitted with dynamic or regenerative control for lowering the load. Further, the Royce governor gear attached to the hoisting motion regulates and prevents excessive lowering speeds with heavy loads. The possibility of brake failure or the sudden burning-out of the motor, either of which would make the load uncontrollable, is thus provided for in the combination above described, and ensures against descent at an unsafe speed. To the hoisting brakes, there is also fitted a hand release arrangement, enabling the operator to lower any load that is heavy enough to revolve the gearing, without expenditure of current.

Improved roller bearings are fitted to the end carriage travelling wheel axles, and also to the axles of the crab or

trolley upon the bridge. These greatly contribute to economy in current consumption. An adjustable slipping drive by gearing is fitted to the longitudinal travelling motor, which absolutely prevents overloading the latter from such a cause as the too rapid acceleration of the crane, etc. It, at the same time, acts as a most powerful brake in stopping the travelling of the crane, in cases of emergency, and is quite a separate arrangement from the usual foot brake operated by the attendant in the cage or cab.

Over-hoisting safeguards are fitted to both the main and auxiliary hoisting motions, which in the event of lifting a load too high, open the circuit in the hoisting direction only, so that while it may not be lifted higher, it can be lowered by reversing the motor or using the hand release arrangement referred to. When a certain predetermined point has been passed, the lifting circuit is again automatically restored without further attention.

To overcome the possibility of loose keys in pinions, etc., the makers have adopted the principle of forging pinion shafts out of stock equal in diameter to the pinion. This puts the vexed question of loose keys and broken pinions beyond a possibility.

All gearing upon the crab, wherever possible, has been placed inside the bearings, thus facilitating the replacing of a bearing sleeve. All bearing sleeves are semi-spherically seated, and can easily be slipped into position without disturbing the gearing. Further, this arrangement allows of the gear of the main hoisting barrel being mounted directly upon the end of the barrel. This gear ring is made up of a wrought steel ring forged from a billet and shrunk on. Such a method indisputably overcomes any possibility of hidden blow-holes, and consequent broken gears, or even gear teeth, as may be the case with steel castings.

All the motors are of the six pole, totally enclosed slow speed type, especially designed and built for crane work. The commutators are mounted upon the armature spiders, so that it is quite possible for a mechanic to replace a shaft without disturbing the connection between the armature coils and commutator. All carbon brushes and brush holders in the several crane motors are of the same size. Field coils can be replaced without removing the armature from the motor frame and disturbing the shaft couplings. The bearings are ring lubricated and absolutely oil retaining. All the detailed parts of the crane, including motors, controllers, etc., bear a distinguishing number to facilitate ordering of spares, and all similar parts are strictly interchangeable.

Respecting wiring of the cranes, all wires are run within solid drawn steel tubing, the fittings for which, such as bends, tees, etc., are screwed together, and insulating bushings used to prevent chafing. Where the wires leave the tubing, this allows of no possibility of damage caused by the constant vibration of the crane in operation. There is also provided and fixed in the cage a suitable terminal board, enclosed under cast iron covers, by the use of which it is possible to separate the circuit of the motor from its respective controller for testing, when necessary.

The makers seem, as far as it is possible, to have designed the parts to make everything easy of access, and have provided hand operating gear to all motions.



Electrically-operated overhead traveling cranes manufactured by Royce, Ltd., of Toronto and Manchester, England.

Among orders received during the past 18 months, may be mentioned two overhead travelling cranes of 350,000 pounds capacity, for the Kawasaki Dockyard, Japan, and two cranes of similar size and capacity as those, for David Rowan & Co., for Lobnitz & Co., Renfrew, Scotland.

The Canadian business of Royce Ltd., is directed from their registered office, Lumsden Building, Toronto, by C. S. Mallett, a gentleman of large experience and intimacy with the firm's product as a many years' employee.

CANADA CAR AND FOUNDRY CO.

The Canadian Car and Foundry Co. has received an order from the Grand Trunk Railway for two thousand freight cars (making four thousand cars ordered by this progressive railway in two weeks), and another order of twenty-five thousand freight cars from the Canadian Pacific Railway. Regarded as an econ-

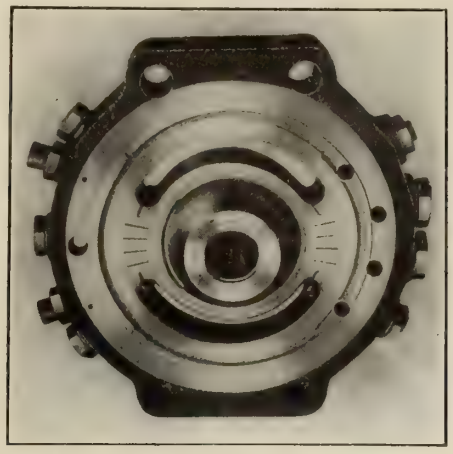


Knock-down interior—Universal Transmission

omic factor in the general situation, it shows that business in Canada, at least, is going full tilt ahead. Mr. Curry, president of the Canadian Car and Foundry Co., stated recently that general conditions were improving in their readjustments, and that the company would soon find itself in a comfortable position. The above orders, just entered, go far towards a fulfilment of the views expressed.

UNIVERSAL TRANSMISSION.

A new device has recently been invented known as "Universal Transmission" by which it is possible to transmit pawer from one form of

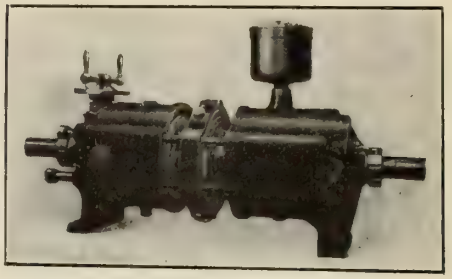


Valve plate—Universal Transmission.

apparatus such as a motor, steam engine, or other prime mover capable of revolving on an axis, to another apparatus in the immediate neighborhood of the first. The value of this transmission scheme lies in the fact that it is very efficient, that revolution in either direction may be obtained, although the prime mover revolves continuously in one direction, and that any required part of the energy of the prime mover may be utilized at will, without steps or abrupt gradation.

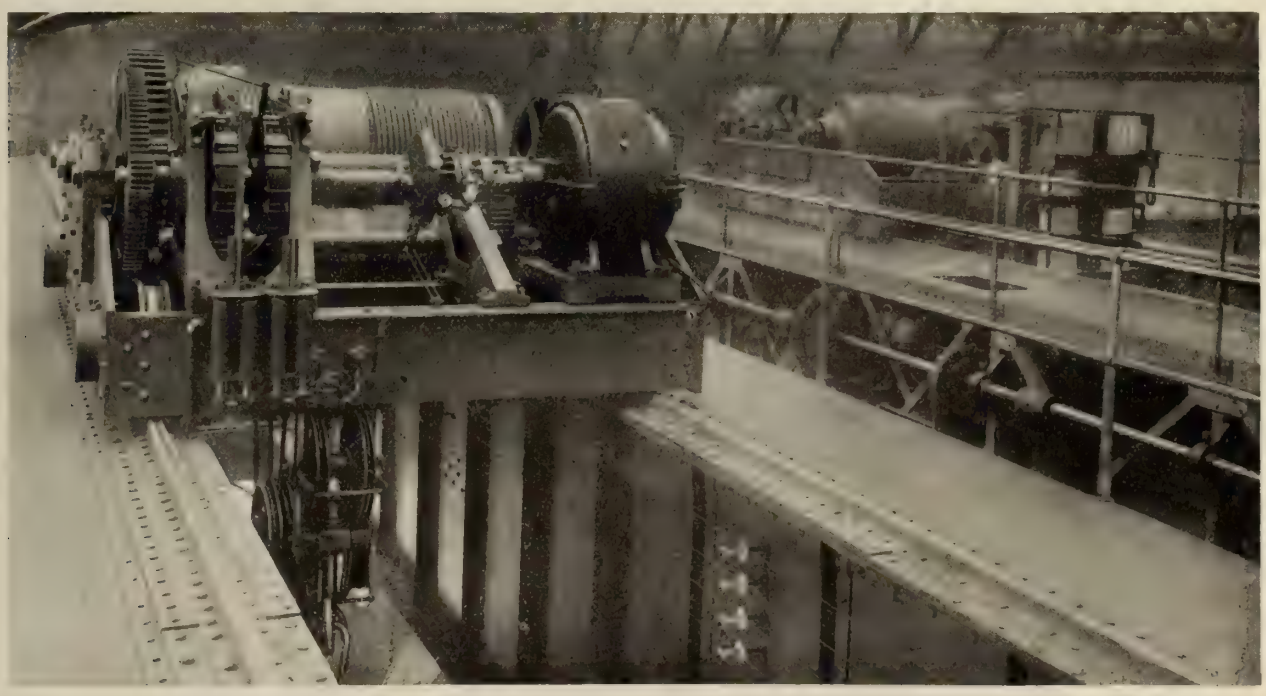
Constructional Detail.

The universal transmission apparatus consists of two revolving parts each operating on a longitudinal axis, although their axis need not necessarily be in the same straight line. In each half or part of the system, a number of pistons and cylinders are placed around the main axis and parallel to it, so that their pistons, when operating, move back and forth in a direction parallel to it. The heads of the piston rods are held in what is known as a head-plate through the centre of which the main axis passes. The head-plate in each case is normally at right angles to the main axis but may be tilted, at any angle to it, by a simple adjustment. Each part of this mechanism is enclosed in a stout metallic casing, and revolves in oil which occupies all the space inside, not taken up by metal.



Assembly, drawn apart—Universal Transmission.

The two parts of the apparatus are separated by a mid-plate through which two passages on opposite sides of the plate connect the two halves of the system. If, when the head-plate is at right angles to its axis, either main axis revolves, there is no motion of the pis-



Electrically-operated overhead traveling cranes, manufactured by Royce, Ltd., of Toronto, and Manchester, England.

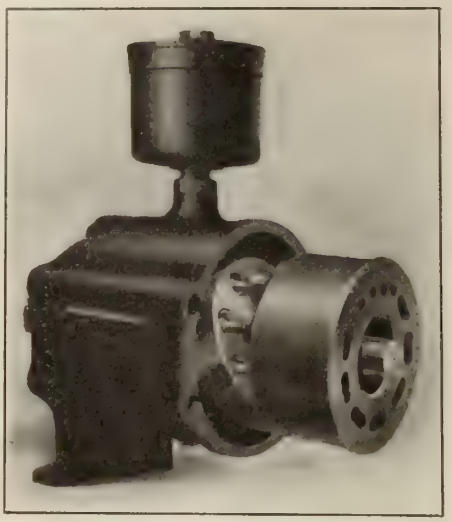
tons in their cylinders. Slightly tilting the head-plate causes the pistons to work, and the head-plate revolving sets up a current in the oil from one half of the system to the other half through the passages in the mid-plate. The current, produced by the pistons operating in one end, causes the pistons in the other end to operate in unison, which in turn continues the revolving motion. The amount of energy transmitted depends on the angle at which the head-plate is held. By simply reversing the angle the second end is made to rotate in the opposite direction.

The scheme as yet is limited in its application, being so far specially designed for turret and gun control in naval work. The apparatus is being manufactured by the Universal Transmission, Ltd., of New York, and is being introduced on the Canadian market.

THE CANADIAN SIROCCO CO., LTD.

THE American Blower Co., Detroit, Mich., with factory also at Troy, New York, and branch offices throughout the world, have come to realize the industrial importance of the Dominion of Canada, as evidenced by the charter application just filed, for a company to be known as the Canadian Sirocco Co., of Windsor, Ontario. This company has acquired from the City of Windsor, a tract of land, centrally located, comprising about 4½ acres, situated on the Essex Terminal Railway, and will proceed at once with the erection of a plant, which, when completed, will doubtless be one of the most complete of its kind on this continent. Work is to proceed at once on the construction of the erecting shop, (50 x 200 feet) which will be of steel and concrete construction, also the office building. This is about all that seems possible of completion for occupancy this winter, and probably the foundry building will come next, and be started in the spring.

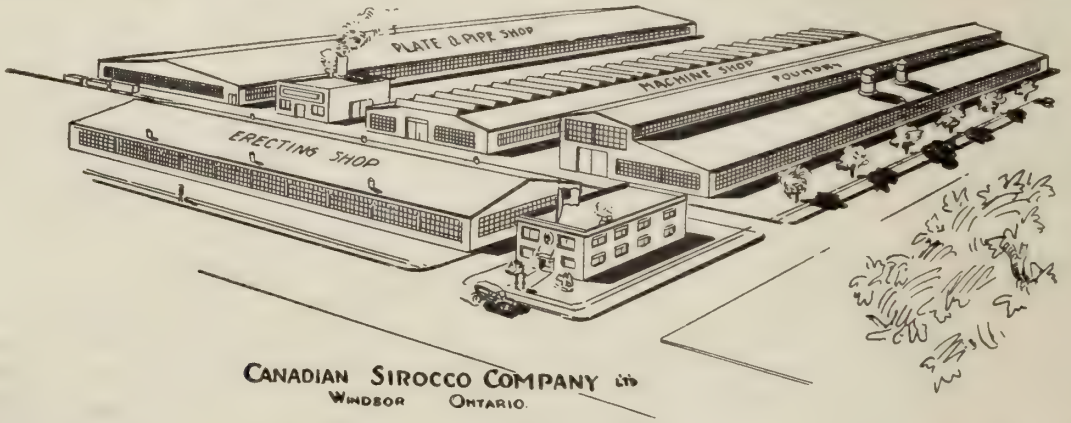
The company will hold the exclusive patent rights for the manufacture in Canada of the famous "Sirocco" fans and blowers, which have revolutionized the blower business of the world by their space and power-saving features. These patents are controlled in the United States, the U.S. possessions, Mexico, Central and South America and Japan, by the American Blower Co., and in Europe, by Davidson & Co., Sirocco Engineering Works, Belfast, Ireland, home of S. C. Davidson, the inventor.



Driven end—Universal Transmission.

Sirocco fans are being largely specified and used throughout the world for mechanical draft on boilers, mine ventilation, heating and ventilating plants, for public buildings, school houses, factories, stores, and in the British navy. The Canadian Sirocco Co. will also manufacture the full line of the American Blower Co. products, consisting of fans, blowers, heating, ventilating, drying apparatus, steam engines, steam traps, etc.

The Canadian Sirocco Co. enters the Dominion of Canada with the complete engineering staff of The American Blower Co. at its disposal, and the City of Windsor has been fortunate in securing this important industry.



CENTRAL RAILWAY AND ENGINEERING CLUB.

On the evening of Friday, December 1st, The Central Railway and Engineering Club of Canada held a very enjoyable "smoker" at the St. Charles Hotel, Toronto, when about 250 members and their friends were present. The earlier part of the evening was devoted to euchre, after which refreshments were served. The company then settled down to enjoy an excellent program of music, etc., provided by Mr. H. G. Fletcher, chairman of the reception committee The various items were received with much favor, not the least popular being a ventriloquial "turn" by Mr. Kelly.

UNITED ENGINEERING & FOUNDRRY CO.

Suit was entered Nov. 27th, 1911, in the United States Circuit Court of New Jersey, by the United Engineering & Foundry Co., of Pittsburg, Pa., against R. D. Wood & Co. and the Camden Iron Works, for infringement of patents controlled by it on steam hydraulic forging presses, working on the single lever automatic cut-off principle, of which the United Engineering & Foundry Co. has in operation eighteen presses ranging from 150 tons to 5000 tons capacity.

GEOMETRIC THREADING MACHINE.

THE Geometric Threading Machine, illustrated and described on pages 308 and 309 of the November issue of Canadian Machinery, is the product of the Geometric Tool Co., New Haven, Conn.

Mr. Lever, the big soap man and noted philanthropist, speaking near Bolton, England, lately, said he knew of employers who asked were they their brothers' keepers? If they were stronger, and had more intelligence and more opportunities, then they had the responsibility of helping their brothers. They should pay the highest salary that an industry could afford, and should fix wages as if for their brothers and sisters. Dividends and wages should have at least equal consideration, and if there was to be any tendency to advantage, it must be with wages.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

A NOVEL COUNTERBORE.

By A. D. Campbell, Hamilton.

THE counterbore here shown, in the course of over twelve months' service, has proved a useful tool for facings and recesses for hexagon nuts and bolt heads. The taper shank and arbor or spindle, are of tool steel (Jessop's), made in one piece; the tang of the shank being hardened and tempered, as is also the end of the spindle, to prevent cutting and burning. Referring to Fig. 1, the high-speed steel cutter is double-ended, one set of teeth doing the cutting, while the other set is engaged by teeth

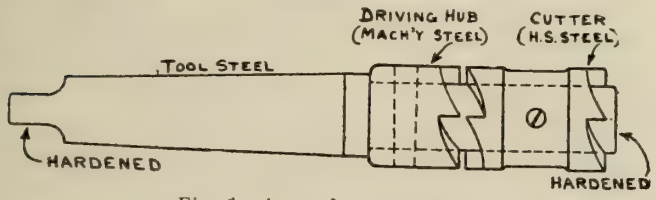


Fig. 1.—A novel counterbore.

of corresponding shape on the driving hub. This hub, of machinery steel, is shrunk and pinned upon the spindle after the latter has been ground all over. That part of the spindle which enters the hole to be faced is ground .005 inch small to prevent binding.

When one end of the cutter gets dull, it can be reversed and the other end used. If it wears out, a new cutter can be quickly and cheaply made, or the old one can be annealed and the teeth cut deeper. The headless set screw shown is merely to keep the cutter from dropping off the spindle. From Fig. 2 and its corresponding table Fig. 3, the dimensions of spindle for various sized bolts may be obtained, while the other table, Fig. 4, gives the dimensions of the driving hubs and cutters.

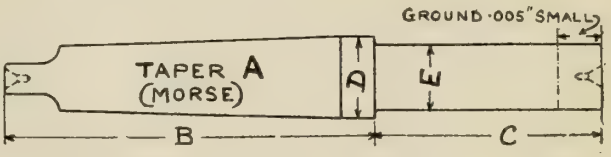


Fig. 2.—A novel counterbore.

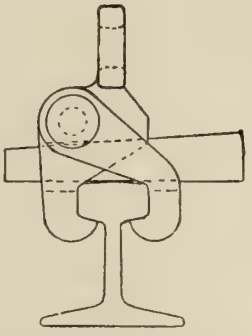
SIZE OF BOLT	TAPER A	B	C	D	E
3/8"	N° 1	3"	1 7/8"	9/16"	3/8"
1/2"	N° 2	4"	2 1/8"	7/8"	1/2"
5/8"	N° 3	4 1/2"	2 11/16"	1"	5/8"
3/4"	N° 3	4 1/2"	3 1/16"	1 1/8"	3/4"
7/8"	N° 4	5 1/2"	3 3/8"	1 1/4"	7/8"
1"	N° 4	5 1/2"	3 3/4"	1 1/4"	1"
1 1/8"	N° 4	5 1/2"	3 7/8"	1 1/4"	1 1/8"
1 1/4"	N° 4	5 1/2"	4 1/4"	1 3/8"	1 1/4"

Fig. 3.—A novel counterbore.

AN IMPROVED RAIL CLAMP.

THE "Canal Record" gives the following description of an improved clamp used in the construction tracks, and invented by W. H. Bates, superintendent of steam shovel repairs. After a six months' trial, it is now permanently adopted, and 350 pieces of the apparatus have been ordered for service.

The function of this clamp is to act as a "stop," when a steam shovel is moving forward, to prevent its running off the end of the track; also to "block"



Improved rail clamp.

the truck wheels securely in place when the shovel is working. The clamp used previously, was attached to the rail by means of a key driven under the base of the rail, consequently it was necessary to place the clamp between ties. When the track is in mud and water up to the rails, the annoyance and delay incident to attaching the old clamp were considerable; furthermore, the ties often interfered with locating the clamp where desired.

The new clamp is fastened to the rail by means of a tapered key of steel passing crosswise over the rail, and thus permits its being set directly over a tie, or otherwise. The key being above the rail, avoids mud and water.

The principle, on which the apparatus works, is similar to that of a pair of ice tongs. The clamp consists of two steel castings which form the hooks and body of the ice tongs as well as a convenient handle. These castings are fastened together by means of a heavy rivet which acts as a hinge pin. The hooks bear on the under side of the rail head when the wedge is driven above the rail and below the hinge pin; thus giving a secure grip on the rail. The cost of the new clamp is considerably less than that of the old style.

A DRILL GAUGE FOR THE TOOL CRIB.

By Chas. Hattenberger, Buffalo, N.Y.

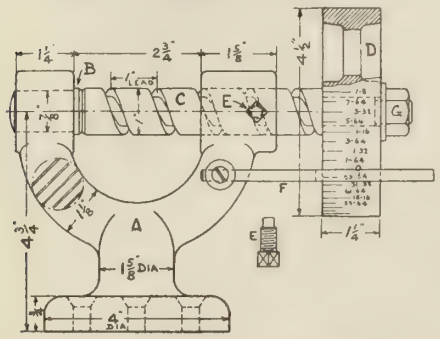
THE gauge herewith illsutrated is in principle a micrometer caliper of special form, adapted for quickly measuring drills, reamers, counterbores, etc., which have no size stamped on them, or have had the marks obliterated. Such a gauge screwed to a bench or rack in a convenient spot will save the toolkeeper much time spent in trying the sizes with ring gauges or ordinary calipers. The gauge consists of a cast-iron stand A, having two arms, one of which is drilled 7/8 inch diameter to take the an-

DIMENSIONS OF DRIVING HUBS AND CUTTERS

SIZE OF BOLT	DRIVING HUB		CUTTER FOR HEX BOLT HEAD		CUTTER FOR HEX. NUT	
	DIA	LENGTH	DIA	LENGTH	DIA	LENGTH
3/8"	11/16"	5/8"	11/16"	1"	7/8"	1"
1/2"	15/16"	3/4"	15/16"	1 1/4"	1 1/16"	1 1/4"
5/8"	1 1/16"	3/4"	1 1/16"	1 1/2"	1 5/16"	1 1/2"
3/4"	1 1/4"	1 1/8"	1 1/4"	1 3/4"	1 9/16"	1 3/4"
7/8"	1 3/8"	1 1/4"	1 3/8"	2"	1 3/4"	2"
1"	1 9/16"	1 3/8"	1 9/16"	2 1/8"	1 15/16"	2 1/8"
1 1/8"	1 3/4"	1 1/2"	1 3/4"	2 1/8"	2 3/16"	2 1/8"
1 1/4"	1 7/8"	1 5/8"	1 7/8"	2 1/4"	2 3/8"	2 1/4"

Fig. 4.—A novel counterbore.

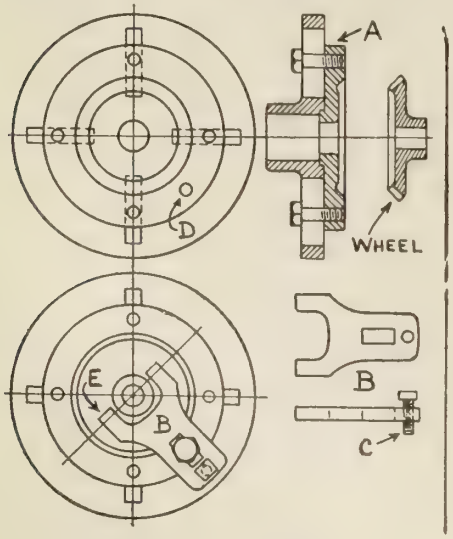
vil B, which is pressed in. The other arm is not screwed, but is bored out plain to take the measuring screw C, 1 inch diameter. The lead of this screw equals one thread per inch, the groove being ¼ inch wide and 3-16 inch deep. One end of the screw is turned down to fit the hub of the cast-iron wheel D. The latter has four spokes and is turned to 4½ inches diameter. The circumference



Drill gauge for the tool crib.

is then graduated in the milling machine into sixty-four parts, which are marked from zero to 63-64. A small screw E fits into the groove of the measuring screw and acts as a nut.

Readings are taken by means of the straight edge F, which is made of round cold-rolled stock, and is filed flat for a portion of its length, in order that it may be brought close up against the wheel and clear readings obtained. Its round end is clamped in a boss which projects from the casting A. When the end of the screw C is touching the anvil B, the wheel must be adjusted on its spindle so that the zero mark comes in



Jig for bevel wheels.

line with the top of the straight-edge F. It can then be secured permanently in position by the nut G. The face of the anvil and end of the screw should be case-hardened with cyanide, and the base of A drilled for three holding-down screws.

Readings are obtained by inserting the drill, or other tool to be measured, between the end of the screw and the anvil and reading off the size on the wheel at the straight-edge. If the drill is larger than 1 inch, a number, equal to the number of revolutions of the wheel from zero, must be added to the reading. Thus, in gauging a 1¼ inch drill, the wheel will make one complete turn and stop at the ¼ mark. Similarly for a 2¼ inch drill, the wheel will make two and a quarter turns. In practice the toolkeeper does not need to keep track of the number of revolutions. The fractional reading is all he needs, since his eye enables him to tell whether the reading is for a ¼, 1¼ or 2¼ drill.

A METHOD OF TWISTING RETARDERS FOR BOILER TUBES.

By W. H., Collingwood.

FOR the benefit of those whose occupation does not bring them into close touch with boiler work, it may be as well to explain that a retarder is a long thin narrow plate twisted into a helix and inserted in the tube; its purpose being to give a rotary motion to the hot gases and to reduce the speed of their passage.

In the shops of the Collingwood Shipbuilding Co., Collingwood, Ont., such retarders are frequently called for as part of the equipment of Scotch marine boilers built there, and the following method is employed for twisting them.

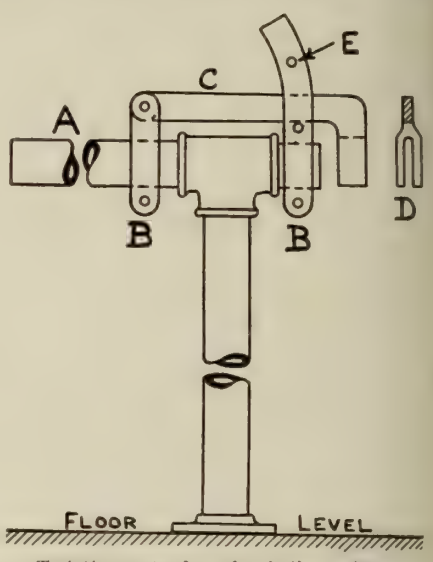
The retarders for 3-inch tubes consist of steel strips 10 feet long by 2½ inches wide by ⅛ inch thick. One end is gripped in the chuck of an ordinary bolt cutter, while the other end is prevented from turning by the device here illustrated.

This latter is made up from 3-inch w.i. pipe, and besides gripping the free end of the retarder, also keeps it straight. The pipe A stands at the same level as the centre line of the bolt cutter. Two clamps B.B. are bolted round the pipe, and a swinging arm C is fulcrumed to one of them. This arm has a narrow jaw at its free end, as seen in the end view D, and may be raised-up above E, to receive a pin, when required. The strips to be twisted are inserted in the tube, three at a time. At one end they are gripped in the bolt cutter chuck, and the jaw of C brought down over the other end prevents them turning. The bolt cutter is next started on its lowest speed, and the twisted effect produced throughout the entire length of each retarder.

JIG FOR BEVEL WHEELS.

By G. Barrett, Montreal.

FOR boring mitre, bevel or skew gear wheels, the jig here shown will be found useful in a shop doing much repetition work of this class. To make the jig, proceed as follows:—Take a circular plate A, about one inch thick by nine inches diameter, and turn it up true all over, leaving a boss on the back about ¼ inch high. Next, put a recess in the lathe face-plate, slightly deeper than the boss, and fit the latter nicely all round, so that the jig can be set in place by a few light taps of a hammer handle. The slots in the face-plate are now marked on the jig A, and the latter drilled or tapped for two or more set screws, as shown. Replace the jig, tighten set screws, and rough-out the face a little smaller than the outside diameter of the teeth of the wheel to be bored, keeping the angle correct. Then



Twisting retarders for boiler tubes.

skim up, till the face and the inside corner of the teeth bed themselves on the jig. Next, make a clamp, as shown at B, to hold the wheel in place while being bored. This may be made of ½-inch or ¾-inch steel plate, the jaw being cut out large enough to clear the boss on the back of the wheel. The set screw C serves to adjust the height, being tapped through the clamp and bearing on the face plate. The jig has a tapped hole at D, to take the set screw which secures the clamp. The slot in the latter, allows it to be adjusted longitudinally on the former. The jaw should be made long enough to reach beyond the centre line, as shown at E, to ensure the wheel lying flat on the jig.

Separate jigs can be made to suit different sizes and types of wheels, each jig being marked for its own class. It is well to put a mark on top of the jig and a corresponding mark on the lathe face-plate so that the jig may always be replaced in the same position.

I have introduced this arrangement into several shops and have always managed to increase the output by about 50 per cent.

TIRE-HEATING APPARATUS.

By R. N. Saunders, Montreal.

THE accompanying cuts show an apparatus for burning crude oil and designed to heat tires in batches of six or more at one time. It is in successful use in the Angus Shops, of the C.P.R., where it is handling truck wheel tires up to 40 inches in diameter. The tires are stacked on top of each other upon a fire-brick base, hollowed out in the centre. As seen in fig. 2, the base has three air passages leading from the centre to the outside, their purpose being to relieve the pressure set up inside the tires by the air blast, while the hollowed centre gives upward direction to the hot gases, and thereby distributes the heat more evenly over the whole pile.

A is a cast iron pipe enlarged at one end, C and B is a Rockwell oil-burner, coupled by means of flexible metallic hose to the compressed air and oil lines. The open end of the combustion chamber C, is covered by a perforated plate E, with one-inch hole at the centre, opposite the burner. This plate allows sufficient air to be drawn in to secure complete combustion in chamber C and pipe A. The fierce flame, issuing from A, strikes the fire-brick base, and is thence deflected upwards, as shown by the arrows in fig. 1. A circular steel plate, about 3-16-inch thick and of sufficient diameter to cover the largest tires heated, is bolted to the end of pipe A. It is lined with asbestos, the purpose being to conserve the heat. The whole apparatus is carried on a cast iron bracket, which can be adjusted vertically on the supporting column by means of the balance weight. Bolt D, working in a slot in the column, prevents the bracket from swinging round. The circular plate is maintained at a height of 3 to 5 inches above the top tire, in order that the burnt gases may freely escape.

This heater is giving excellent satisfaction, and will heat six tires in from twenty to twenty-five minutes. Previous to its installation, tires were heated singly by city gas, the time occupied for each being about eighteen minutes. The lower tires get more heat than the upper, but this is an advantage, as otherwise, they would cool down too much during the time occupied in shrinking the upper tires on their wheel centres. The vertical column supporting the burner, etc., is of wrought iron pipe, and can turn freely in the socket at its foot. When the tires are sufficiently heated, the whole apparatus is swung round out of the way, enabling the crane to operate.

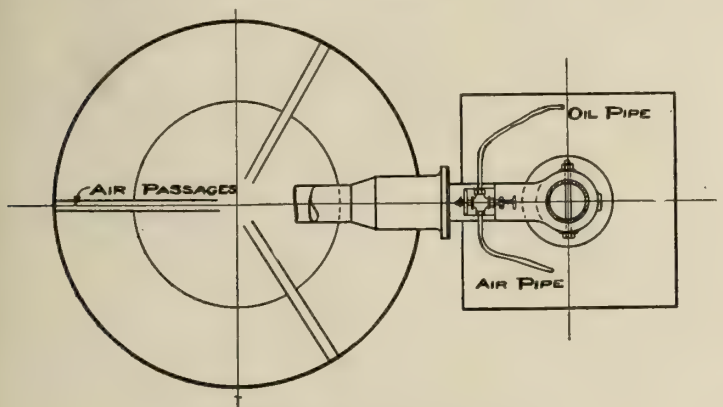


Fig. 2.—Tire heating apparatus.

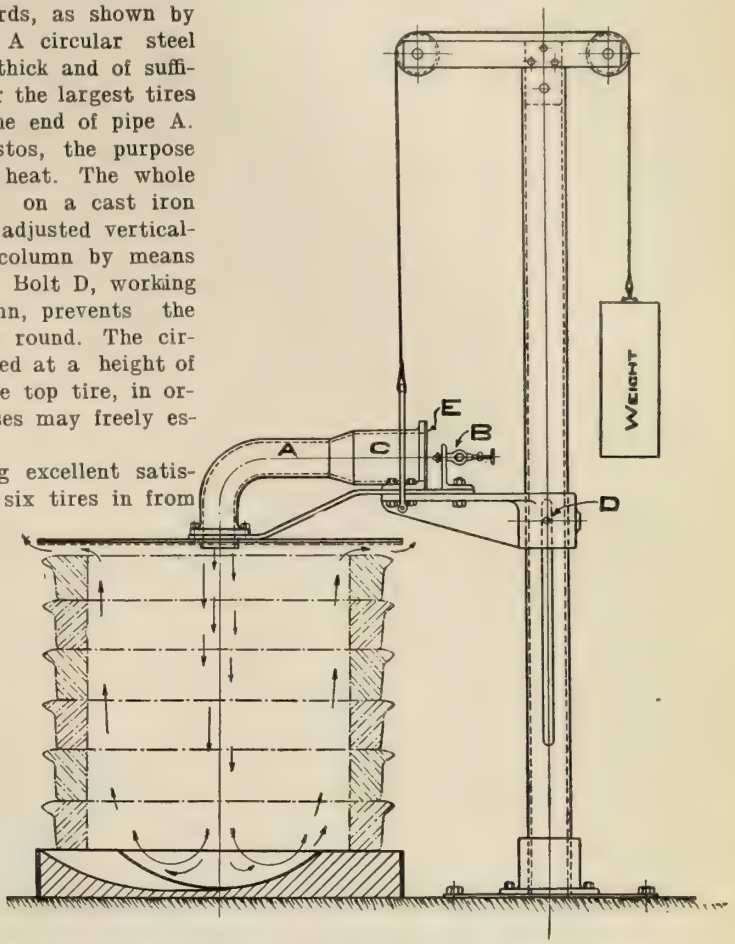


Fig. 1.—Tire heating apparatus.

Mechanical Drawing and Sketching for Machinists*

By B. P.

A Series of Progressive Lessons Designed to Familiarize Mechanics With the Use of the Apparatus Necessary to Make Simple Drawings, to Encourage them to Realize How Important a Factor it is of Their Equipment, as Well as Being a Profitable Pastime.

HEREWITH there is shown a cast iron eccentric strap, suitable for the eccentric which formed part of the November lesson. As may be seen in Fig. 1, the two halves are separated, but in making the drawing, they should be assembled, and if convenient, including the eccentric as well. The two halves of the strap are held together by the bolts B, and the eccentric rod is attached by means of the bolts C. The straps can be adjusted for wear by filing the faces which bolt together. In most cases, the straps do not meet at the centre line, as in this example, but stop ¼ inch each side of it; a ½ inch strip or liner, being inserted, and removed for thinning down as wear takes place in the strap body. It is also a common practice to insert a liner of brass or white metal between the eccentric and the strap to reduce friction. Such an arrangement is shown at A. The oil cup on the back half is cast solid with the strap and is tapped out at the top to receive the hexagon brass cap.

Exercise. — As the drawing has been purposely left incomplete, show the nuts correctly; add in plan, a section along the centre line, and give an end view looking in the direction of the arrow.

Note that the bolts are prevented from turning in the holes by feathers, or dowels, 3-16 inch diameter. The oil cup and its cover are not quite fully

* Tenth of a series of an Instruction Course.

dimensioned, but the student should nevertheless be able to give it correct proportions. A scale of ½ size, (3 inches to 1 foot) will be suitable for this drawing.

Rachet Wheel.

Fig. 2 shows a ratchet wheel and the method of laying out the teeth. Put down the centre lines for the upper view and draw the three inner circles. Then set the compasses to a radius of 2⅝ inches and lightly draw a circle to represent the outside diameter over the teeth. The depth of the teeth is not directly stated, but from other dimensions given it is found to be ¼ inch and another circle is lightly drawn to represent this amount. Next divide the circumference of the outer circle into the same number of parts as there are teeth. If the number of teeth be an odd quantity, like 29 or 37, the only way to proceed is to set the dividers to the approximate pitch and step off the distance all round the circle; re-adjusting the dividers on arriving again at the starting point and repeating the process until the exact pitch is found.

In the present example there are 30 teeth,—a very convenient number. Since a circle contains 360 degrees, there will be 60 degrees in one-sixth of a circle, and one-sixth of 30 teeth is 5 teeth; hence if we take the 60 degree set-square, and draw a line from the centre at an angle of 60 degrees with the horizontal, and then divide the arc cut off by this line into five equal parts, we shall obtain the pitch of the teeth much quicker than if we divided the whole circle. We, therefore, divide the arc A. B. into five equal parts and mark off the pitch thus obtained all round the circle. From each point, draw short radial lines, representing the faces of the teeth; the backs of the latter being obtained by joining the point of one tooth to the root of the next.

The key securing the ratchet wheel to its shaft is ⅜ inch wide by 3-16 inch thick and is embedded equally in wheel and shaft. The hub is 1¼ inches wide and the rim ¾ inch wide, while the thickness of the web connecting them is ⅜ inch.

Exercise.—Draw full size, making lower view in section, and giving an outside view to the right of the elevation.

THE PRESENT BUSINESS CONDITION.

TO the thoughtful citizen it is apparent that the tendency of much of the state and national legislation is to depress rather than to encourage activities which make for the country's material advancement and prosperity. Political and social unrest find expression in extreme measures which seriously disturb economic stability. Radical and unwarranted legislation is proposed as the panacea for every ill and every shortcoming. Poltical mountebanks feed upon prejudice and build upon hatred and selfishness. The pendulum of public opinion, therefore, has swung to extremes and has caused apprehension and uncertainty where confidence and certainty should prevail.

In the meantime a country whose normal temperament is hopeful and optimistic, a land of wonderful resourcefulness and boundless possibilities, of remarkable energy and constructive ability, is languishing under a prolonged industrial depression.

That the panic of 1907 was primarily a financial disturbance which should be followed by a period of industrial depression was to be expected. That this depression should be prolonged over a period of years is unwarranted and must be laid to causes which should and must be removed. Be it therefore

Resolved, that, in the judgment of the National Founders' Association the time has arrived when the country should awaken to the real situation, discountenance public expressions and legislative action designed to discourage legitimate enterprise and commercial and industrial development, and denounce the political tinkerers who destroy confidence and undermine the economic stability of a great nation. And be it further

Resolved, that we bespeak for the American people a returning confidence in themselves, a conservative attitude on all controversial problems and the application of sane methods to their solution; a more friendly co-operation between capital and labor, between employer and employe; that we impress upon the agencies of government the duty to promote rather than retard the progress and prosperity of a whole people.

* Statement and resolution adopted at fifteenth annual convention of National Founders' Association, New York, November 16, 1911.

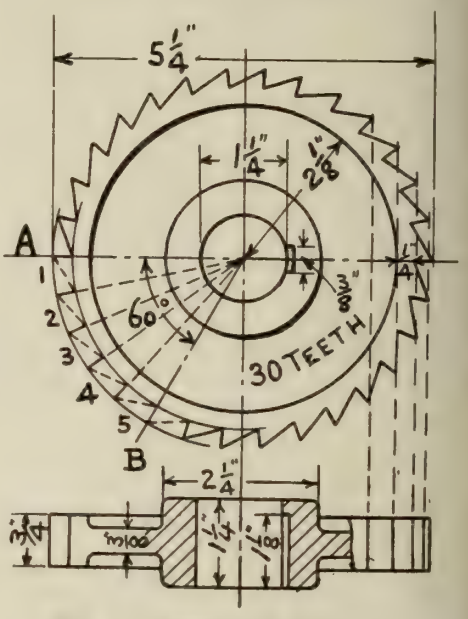


Fig. 1.—Drawing and sketching.

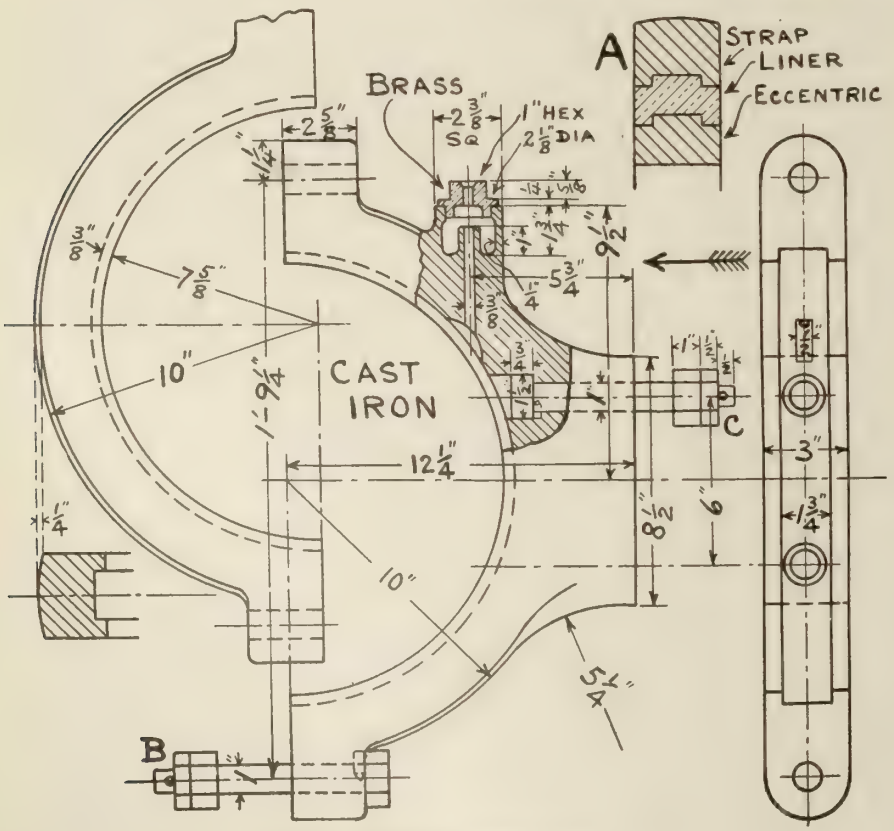


Fig. 2.—Drawing and sketching.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tendtng Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

A NEW MACHINE TOOL.

MUCH has been written pertaining to the problem of boring square holes, and the attempts towards the construction of a practical tool for this class of work have been numerous. Various devices in the shape of attachments for ordinary lathes or milling machines, etc., have been recently offered in the market, but they have failed to produce satisfactory results, owing to the difficulties in the proper mounting of the device on any standard machine tool. Experiments have, however, conclusively proved that such attachments cannot be fastened rigidly enough to withstand the side thrust caused by the eccentric jarring motion of the cutter, at right angles to the working spindle. It was further demonstrated that the carriage of the average lathe did not offer sufficient stiffness to hold the working pieces rigidly in position. This is one of the vital points in obtaining perfectly square holes.

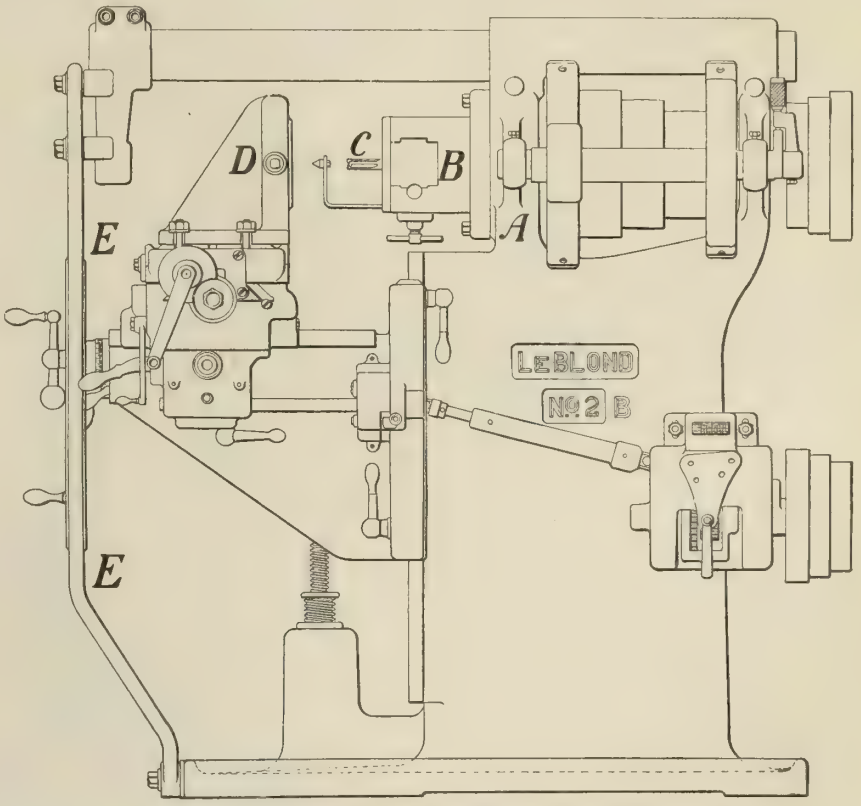
The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, who enjoy the reputation of being leading machine tool designers, have taken an interest in this problem, and after careful study of the subject and its former weaknesses, have come to the conclusion that this work can only be done satisfactorily with a special machine tool, in which the arrangements for cutting square holes are embodied in the design. Considering, however, that a machine which would do nothing else but cut square holes, would be too great an investment to many customers, they have designed a combination machine tool which is not only adapted for milling square holes, but also possesses all the features of a standard milling machine.

It is designed along the lines of the LeBlond No. 2 plain milling machine, with such changes as are of advantage to the successful operation of the square hole cutters. The principle used in this work is the same as employed in other devices, namely, the revolution of a triangular shaped bit, similar to an end mill, in a stationary master guide of appearance much like a regular drill chuck. This stationary guiding chuck is fastened directly to the column of the machine by means of a flange, and entirely eliminates all the former troubles of lost motion.

The cutter receives its motion from a special driving member fastened to the nose of the spindle. This not only causes the cutter to rotate, but at the same time gives it freedom to travel eccentrically in the master guide. The whole arrangement for cutting square holes, simple in itself, is easily detached, the machine being then ready for regular milling work or vice-versa. As it is advantageous, when cutting square holes in tough material, to previously drill a round hole, the machine is furnished with an appliance for operating ordinary twist drills, and which engages in the arrangement for boring square holes. Both operations can be done in succession on the same workpiece.

As the attachment for cutting square holes projects considerably beyond the nose of spindle, it would on a standard machine decrease the working space in front of the cutter, therefore, the column bearing the main spindle has been set back to gain the distance taken up by this projection, thus maintaining the full working range of the table. In order to secure absolute rigidity of the work pieces on the table, a special brace is provided which connects the knee with the overhanging arm as well as with the base of the machine.

As the cutting of square holes requires a very fine feed, the machine is arranged with two separate cross feeds, one for regular milling work and the other for extra fine feeds starting from .001 inches. In cutting square holes, the work must be held absolutely rigid, a special vise being furnished with the machine for this purpose. The possibility of using this machine for regular milling work, as well as for cutting square or rectangular holes and other odd jobs, will make it a valuable addition to the equipment of every toolroom, to say nothing of regular manufacturing purposes where square holes are used for commercial work. Fig. 1 shows a side view of the complete machine; fig. 2 shows an axial cross section through square hole cutting arrangement, and fig. 3 illustrates the appliances for the operation of twist drills.



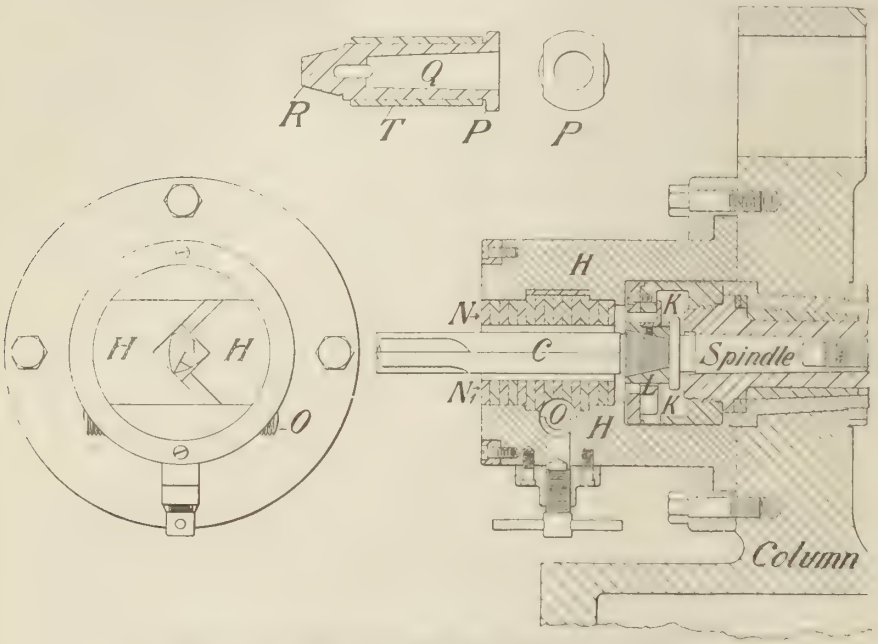
New machine tool.—The Niles-Bement-Pond Company.

Detail Description.

Fig. 1.—A, column with main spindle bearing; B, Detachable chuck for cutting square holes; C, the cutter; D, special vise for holding work; E, special brace connecting knee with overhanging arm and base G.

Fig. 2 :—The square hole arrangement shown in this cross section con-

sists mainly of two separate bodies. 1st—the driving member K, which is screwed to nose of spindle; 2nd—the stationary guiding chuck H, which is bolted to the column over main bearing. The driving member contains a floating driving dog, L, into which cutters C engage by means of a taper thread. Behind this dog is a floating thrust plate



New machine tool detail.—The Niles-Bement-Pond Company.

which takes up the end of drills. The stationary guilding chuck contains the master guide, which consists of two jaws N.N-1. forming an adjustable square guiding hole in which the drill C is forced to describe its particular cam motion. O is a right and left hand screw for opening and closing these in accordance with size of drill used.

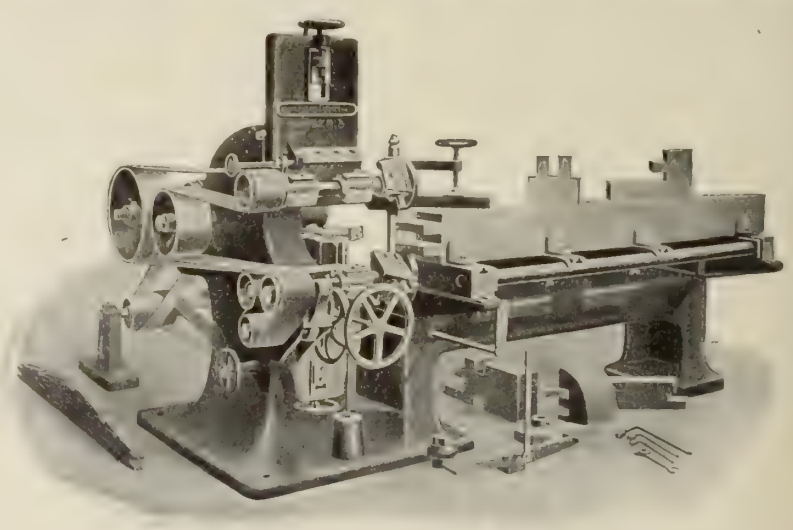
Fig. 3, for boring round holes in connection with the arrangement for cutting square holes. A round bushing, T, is inserted in the square guiding hole, which serves as a bearing for the shank R, and contains a regular Morse taper Q. This shank is fastened in the driving member by means of the taper thread R, and describes a regular revolution inside the bushing T. Any size twist drill can be inserted in the Morse cone, and the whole arrangement is easily taken off. The machine is furnished with complete equipment for regular plain milling. The range for boring square holes is from ¼ to 2 inches.

It is evident that the installation of such a machine tool, which is always handy as a regular plain miller, will open new fields of manufacture and will be of value to every tool-room for special work of all kinds.

A GENERAL PURPOSE CAR TOOL.

MANY car shops, especially those largely devoted to repair work, have a good deal of cutting off, gaining and tenoning to perform, but not enough of each kind to justify the installation of separate tools. To meet the demand for a "general purpose tool" which will do all of this work, J. A. Fay & Egan Co., the railway car shop tool builders, Cincinnati, have brought out what is known as their No. 5 Large Car Tenoner and Gainer.

As a gainer, this machine will cut gains in any part of heavy timbers. It will work timbers up to 23 inches wide by 15 inches thick, and the C shaped



General purpose car tool.—The J. A. Fay & Egan Co., Cincinnati.

construction of the frame makes it possible to handle these, in all lengths. As a tenoner, it will cut single or double tenons, and if so ordered may be arranged to cut triple tenons. As a cut-off saw, it will do all kinds of heavy cut-off work, a 20 inch blade cutting-off up to 6 inches thick.

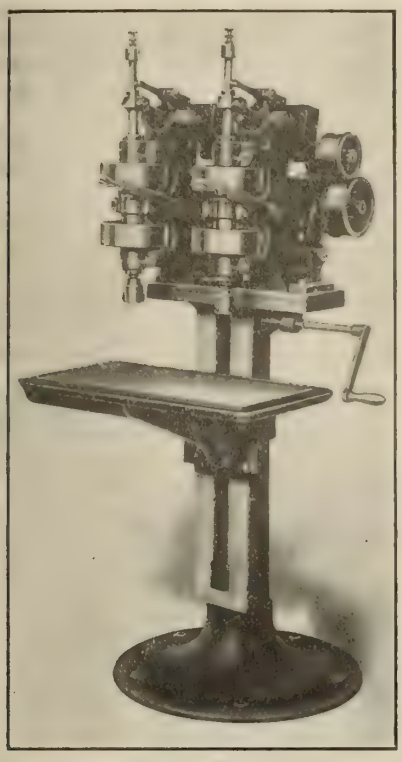
The carriage is moved by rack and pinion feed, the return movement being about three times faster than the forward or cutting movement. There is no under-estimating the value of a machine of this kind in a car shop, because of the variety of work that can be done upon it. Extra heavy construction gives the necessary strength to stand up to continuous operation.

TWO-HEAD AUTOMATIC TAPPING MACHINE.

IN the accompanying illustration is shown a recent addition to the standard line of automatic tapping machines manufactured by The Garvin Machine Co., New York City, and is known as that company's No. 1 two-head automatic tapping machine. Equipped with two heads, it practically doubles the capacity of a one-head machine, and will quickly finish pieces having two holes of different size at one handling. As the machine works automatically after the tap is once started in the work, the operator does not have to wait until the hole has been tapped, but may be busy fixing in another piece for the second spindle to work on, thus keeping both spindles busy all the time and increasing the output over that of a single head by more than 50 per cent.

Each of the spindles is fitted with two friction pulleys, driven in opposite directions by one continuous tensioned belt from an overhead countershaft, and between these pulleys, plays a friction clutch keyed to the spindle. This friction clutch is connected to a lever shown at the right of each head by a toggle arrangement, adjustable for any desired drive, and making an extra safety device to prevent breaking of taps unnecessary.

The tap is started by the hand lever and tripped and reversed automatically at any point by an adjustible screw stop on the upper end of the spindle, which trips the reversing lever at the top of



Garvin No. 1, two head automatic tapping machine.

the machine. The spindles are fitted with a positive drive chuck for holding taps. A screw motion is provided for adjusting the table, which is of generous dimensions, and has an oil groove all around it.

The machine will tap a hole 1-16th to $\frac{3}{8}$ths U. S. standard tap in cast-iron, or 1-16th to 1-4th U.S. standard tap in steel, $1\frac{1}{2}$ inches deep. The machine operates highly satisfactorily at high speed, and is reliable and safe, reducing the breaking of taps to a minimum. The operator's responsibility ends at the starting lever.

NEW TYPE OF SHIPBUILDING CRANE.

THERE has recently been installed at the Camden, N.J., plant of the New York Shipbuilding Co., a revolving locomotive type crane of large capacity mounted on a gantry, and arranged to travel backward and forward on the latter, so as to serve two sides of the pier. The design and construction provide for hoisting loads at two different speeds; the capacities being 35 tons at 20 ft. radius, or 15 tons at 68 ft. radius. The requirements of revolving, backward and forward movements on the gantry and traveling along the dock are taken care of by self-contained electric power.

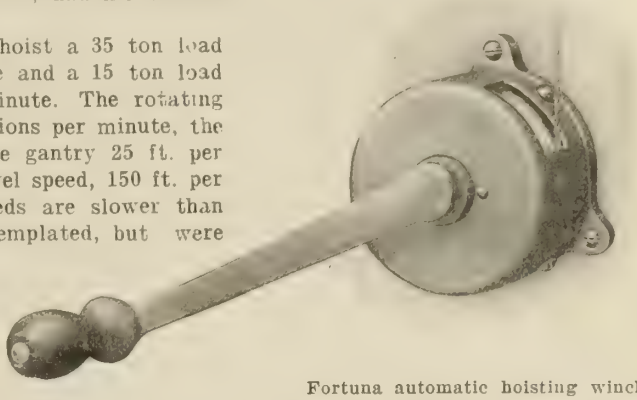
A wire rope attached at each end of the gantry, and wound around a worm driven drum under the centre of the machine, makes provision for the backward and forward gantry movement. Such an arrangement locks the machine and secures against cross movement from high wind force. Travel along the dock is obtained by means of a motor placed in the centre of the gantry, and from which, power is transmitted to one truck on either side of the dock through suitable steel shafts and gearing. One motor is used for hoisting the load, and another for rotating, raising and lowering the boom, and movements across the gantry.

The machine will hoist a 35 ton load at 15 ft. per minute and a 15 ton load at 30 ft. per minute. The rotating speed is two revolutions per minute, the movement across the gantry 25 ft. per minute, and the travel speed, 150 ft. per minute. These speeds are slower than was originally contemplated, but were found desirable on account of lack of available power. The hoist motor is operated by an electric dynamic brake, and electric power, 220 volt, D.C., is delivered to the machine by means of a third rail along the dock, across the gantry, and below the rotating frame.

The machine was designed and built by the McMyler Interstate Co.

THE FORTUNA AUTOMATIC HOISTING WINCH.

A USEFUL device has recently been put on the market by the Fortuna Machine Co., Leicester, Eng. The illustrations give a general idea of this hoisting winch, which can be used for lifting or lowering electric lamps, gas and oil lamps, shutters, blinds, etc. It is made in four standard sizes, capable of handling loads from 50 to 100 lbs., according to size, but may be had of larger capacity if required. The winch can be fastened to the outside of a building in an exposed position, being unaffected by weather, as the mechanism is enclosed. Simple in construction and perfectly reliable, it cannot be tampered with, and is therefore "fool proof."



Fortuna automatic hoisting winch.

To raise or lower the load, it is only necessary to insert the stem of the handle and turn it one way to raise or the other to lower, and at whatever point the handle is withdrawn or stopped, the winch automatically, with elastic grip, holds the load firmly and immovably in position. The gripping force is increased with the weight of the load.

This winch is being handled in Canada by Francis Hankin & Co., 230 Coristine Building, Montreal.



New type of shipbuilding crane.—Makers, The McMyler Interstate Co.

HARDINGE UNIVERSAL GRINDER.

THE Hardinge Universal Grinder No. 190 represents 30 years of practical experience applied to designing a machine that is suitable to do all manner of internal and external grinding in a practical way. Referring to the illustration, there will be seen at the left a steel plate inserted in base of the machine which is graduated to 10 degrees on either side of the zero line. The plate is a 20 degree arc of a circle, 36 inches diameter, therefore fine readings can be readily observed. Changing the bed to different angles is accomplished by unlocking two hand nuts, easily reached from the front of machine. The bed is designed to carry Hardinge Patent Bench Lathe Heads, sizes 3 to 7 inclusive, the spindle and journals of which, being protected with felt rings and dust caps, absolutely prevent emery or cutting material of any kind from coming in contact with the bearings. By the use of the Hardinge Patent Bench Lathe Heads, in connection with the grinder, one is enabled to use draw-in chucks, wheel chucks, face plate, universal or independent-jaw chucks.

The illustration shows the other attachments, namely, No. 191 dead centre head, No. 139 finger for supporting teeth of straight face cutters while sharpening, and No. 193 for supporting teeth of spiral cutters, also while sharpening. The traverse spindle is hardened and ground, and runs in adjustable journals, which are protected with felt rings in a similar manner to the bench lathe heads. In each end of the spindle is a standard taper hole, so that the wheel may be used at either end. The spindle head is graduated to 360 degs., therefore any angle is easily secured. The slide, upon which the grinder head is mounted, is the three-slide style, enabling the operator to move the wheel to or from work rapidly, while fine feeds are attained through the use of the index slide.

The power feed is constructed so that the operator may change lengths of cuts immediately, and may also obtain a micrometer adjustment through the use of knurled nuts on feed control stops. For hand operating, it is necessary only to release the split nut, and use hand wheel. The countershaft is arranged to get a variation of speeds, and is constructed so that the work, emery wheel or both, may be stopped independent of the main drive.

Hardinge Bros., Inc., 3133 Lincoln Ave., Chicago, Ill., are the makers of this Universal Grinder.

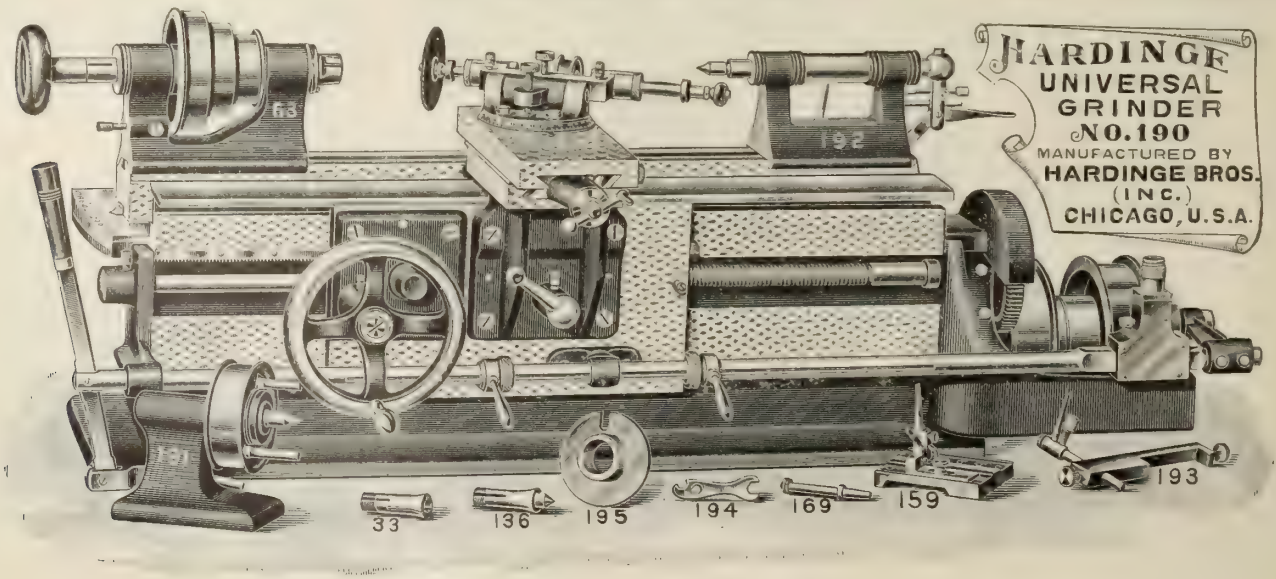
COMBINATION CENTRE DRILLS IN SETS.

THE J. T. Slocomb Co. are putting on the market their combination centre drills in sets. Heretofore, it has been possible to buy these either in boxes containing a dozen of a size, or else singly. The Slocomb Co. realize that in a great many shops it is worth while having a centre drill of each size so as to take care of any work that might be coming along. In some factories where centre drills are used extensively, such sets may not be of interest, but to those making a variety of product in which centreing is not the all important part, they are an advantage to the workmen, as the latter have not then to run about in order to find the right tool when necessity arises. Then, too, nearly every machinist has his own tool-chest of tools, and these sets enable him to have a centre drill which he can use in emergency. Each set is put up in a nicely finished and attractively got-up wooden box.

To-day, centre drills are used in almost every shop, and a great many manufacturers include these items in their list of tools. The J. T. Slocomb Co. have devoted a great deal of time and study to the making of these tools, so as to get the proper shape, size, material, etc. Some little time ago, they started making these drills of semi-high speed steel, and everyone made to-day is of that material. This is quite an important point, for they have been able to prove that the semi-high speed steel combination centre drill will do more work than the carbon steel drill.



Full information regarding these new sets, etc., may be had by addressing the J. T. Slocomb Co., Providence, R.I.



Hardinge Universal grinder.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

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Vol. VII. December, 1911 No. 12

THE McNAMARA CONFESSION.

HUMANITY in unit and mass has always been subject to violent shocks and upheavals, and while each blow finds a definite mark or location, the effects felt, and warning administered, radiate to and embrace usually a much wider sphere. The McNamara confession will, we doubt not, have a salutary result in not only eliminating the destructive element in organized labor, but discourage the enactment of measures on the side of capital which have been many times both inhuman and unprincipled.

Organized capital and organized labor are permanent institutions, each having a part to play in the world's civilization and industrial development, and the McNamara episode is, we believe, the death-blow to coercionists and desperadoes within their ranks, whose misguided zeal and poverty of common sense has hindered that closer agreement and mutually beneficial understanding, so much desired.

ACHIEVEMENT THE TRUE MEASURE.

THERE is a growing tendency, particularly in our industrial organizations, to have one man or one set of men do the "thinking" part of the business and another or others perform the working or operating. Such a caste distinction is no novelty, as in every sphere, domestic, social civil, industrial, political and religious, there has always existed, and of more or less necessity perhaps in the past, this conspicuous feature. Benefits have accrued from its practice, but side by side, and more pronounced as education and intelligence have become better diffused, there has naturally arisen a resentment to a continuance or increase of its scope and display.

We are apt to forget that brains are no monopoly, that an overwhelming majority of their possession belongs to the operating departments of practically all enterprise, and that development of their possibilities, too long conserved and hidden, is making rapid strides towards being a factor of supreme importance. The disposition to limit breadth of thought in a majority, and require them to concentrate on circumscribed fields of operation, is a short-sighted and ultimately disastrous policy. Co-operation of different trades, in the manufacture of any product, is a wise and efficiency-attaining arrangement to be developed and cultivated, but the system, which prohibits a man from being a master of his art, is retrograde and selfish in its aim. Technical, industrial and university education are each contrary to the ideal which would make the employe simply an operator, and represent time and money expended needlessly, being, as they are in such cases, more of a hindrance than otherwise

Sufficient appreciation, is wanting, of the unrest sure to arise from the monotony of expertness acquired only by restricted scope and outlook. Inefficiency is always the result of unrest, and unless a man has within himself the satisfaction of something tangible achieved beyond its cash value, and is conscious of a like rating in estimation by those whom he serves, this inefficiency will prevail in spite of the myriad combating systems so prominent to-day. The trouble is—that some men are ready, without thought or consideration, to accept conditions which will annihilate their personality and bring them increased returns, and others again are willing to put such schemes into practice, also with a view to profit. How many, we ask, either of the instigators of these yellow metal systems, or of the great body of those who are intended to come under their scope, can on sober reflection, say that the scheme is as philanthropic and far reaching in its benefits as is represented?

We are all conscious that two clearly defined sections of personality exist in the world:—Labor and Intellect. We are also conscious that their representatives are known as the "operator" and "thinker" respectively, and, further, that one is a workman and the other a gentleman. Did it ever occur to you that such a condition is prolific of inefficiency, and breeds envy and discontent in spite of increased remuneration offered by a system? Again, it needs no microscope to perceive that too little work forms part of the "thinking" section, and too little "thinking" or opportunity for its exercise is in evidence among those dubbed workmen. Someone has said "that the mass of society is made-up of morbid thinkers and miserable workers, each more or less at enmity with the other."

The nature of our employment, whatever it be, calls for much less pride than we are prone to take, and demands, instead, that we put excellence of achievement as the true measure, not only of our important selves, but of those others whose field lies in a different groove. All of us need the opportunity and should have the encouragement at our daily task whatever it be, to think as well as work constructively, and the more persistently this is practised, the less will be the suspicion attached to the motive behind innovations and the harder to determine caste in industry's ranks.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

MOLDING A GLASS POLISHING ROLLER IN LOAM.

By John H. Eastham, Montreal.

THE following method of molding a heavy roller in loam, for plate-glass polishing purposes, may perhaps interest readers of "Canadian Machinery." This casting was required exceptionally clean and bright, and of as hard a close-grained mixture as was compatible with easy machining. When cleaned, it weighed approximately six tons. Two sets of arms, six in each set, were considered advisable, the casting being nearly seven feet across the rim, and of same design as a double armed pulley.

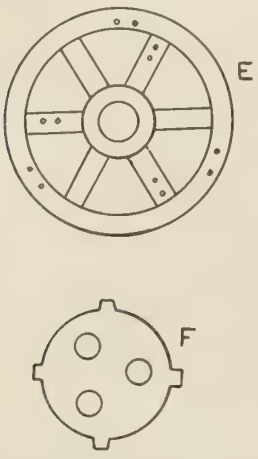


Fig. 2---Molding a Glass Polishing Roller in Loam

Detail of Procedure.

On a heavy base plate, marked A in sketch of completed mold, Fig. 1, a course of bricks was laid, and a sloping parting made at B.B. The core was next swept-up to height required for formation of first hub and set of arms. A plate, indicated at C.C., was bedded one course of bricks below the hub, to secure solidity, considerable pressure being anticipated at this point. A small strickle swept-up the hub, and the first set of arm cores were placed in position. The correct depth shown by an arm or gauge is attached to the main sweep. After bricking-up to the top of the hub, a parting, shown at dotted line, D.D., was made, and the plate E, provided with three long eyes for lifting purposes, bedded to place. The core was next built and swept-up to the second set of arms, and the process of sweeping-out the hub and placing the arm cores repeated. A small plate shown at F, fig. 2, perforated for three runners, was next swept-up with loam to cover this hub, and the core built up to its full height; the inside being left open to facilitate ramming round the gates when closing, and inserting the hub core after drying. The core, being now completed, was allowed to stiffen, whilst the outside of rim, or "cheek" was swept-up, a single course of bricks being built-up on a ring-plate provided with four lugs for hoisting purposes. A tapered parting was made to match the one at base of core, to ensure a good fit and even thickness when closing the mold.

Both parts were blackwashed before stoving, and then placed on the stove car. The core was separated at the parting over lower hub, to guarantee the inside being thoroughly dried. After one good night's firing, the base plate with inside section was lowered into the large casting pit provided for deep molds, the core being placed in the lower hub, and top section lowered to position. The cheek was next lowered over the whole, the top hub core inserted and covered with the small plate F. The gate pins having been fitted into this plate, the inside was rammed-up to the top with floor sand, the crown plate lowered to place, and runner and riser boxes lined up as shown. Cribbing plates of ordinary type were fitted round the job its full depth, the space between them and the brickwork of the rim being rammed-up tightly to prevent all strain.

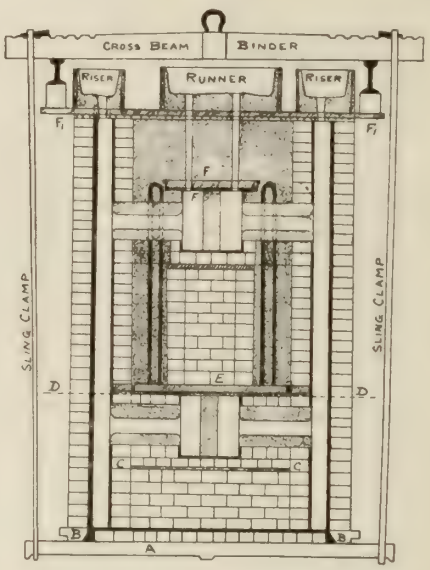


Fig. 1---Molding a Glass Polishing Roller in Loam

A cross-beam clamped down to base plate by sling clamps at four points held the whole mold firmly in position. Feeding was considered unnecessary; one inch of depth added to the rim, to be machined off afterwards, and the heavy risers being ample allowance for shrinkage. There is, no doubt, from the writer's experience, that castings similar to this in depth and general design, give the best results when made in loam; the cost of rigging being about the same, the actual molding time perhaps a little less, and the risk of loss certainly lower, than when made in sand.

Fitting Pipe Templets

(By Joseph Horner, Bath, England.)

FOR a puzzling drawing to make or read, one of the pipe plans for marine engines is hard to beat, the lay-out for ordinary engine houses, factories, water works, gas works, etc., being rather simple by comparison. In all drawings of this kind, the directions of pipes can generally be indicated correctly, but the actual measurements of the lengths of many of them cannot be determined by the draughtsman. The reason lies in the awkwardness of the various bendings and angular relations of pipes and flanges.

When pipes are of copper or of wrought iron, these materials lend themselves readily to corrective settings in bends and flanges, but with cast iron pipes, such settings are not possible. In each case, the main pipes are usually first made and fixed in place from the drawings, but the "make-up" lengths are prepared from templets fitted into the lo-

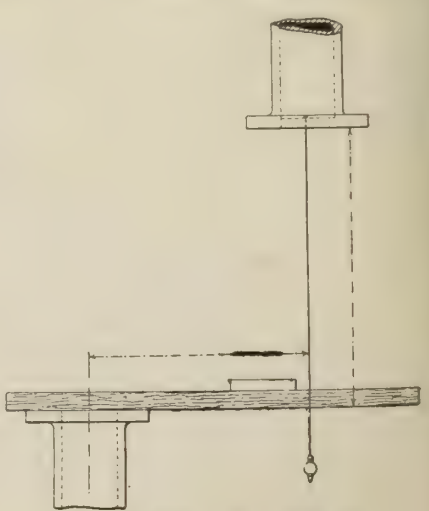


Fig. 1—Fitting pipe templets.

cations that the actual pipes will occupy. In many instances, these have to be curved to fit around parts of machines, or around other pipes, the curving being sometimes in more than one plane. Flanges, too, are often set slightly out of square, or at a considerable angle. Again, pipes may have branches set square, or at some acute or obtuse angle, and frequently the working-in of standard wrought-iron pipe fittings has to be provided for.

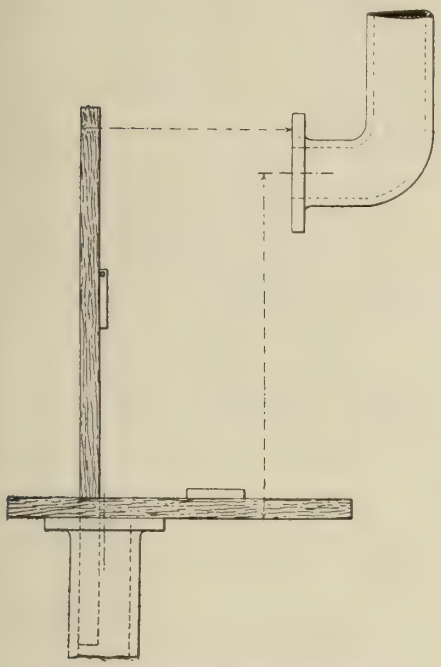


Fig. 4—Fitting pipe templets.

In cast iron pipes, the templet often includes the thickness of metal and the positions of bolt holes. When the work is done away from the shop, the templet must give all that the patternmaker or moulder or machinist requires in order that the finished pipe or pipes shall go into place and be bolted up at once. The foregoing observations hold good also in relation to repair and jobbing work, such as when alteration in the directions of existing pipes, or extensions, have to be made. Some illustrations, therefore, of the methods adopted in making these templets may be of utility.

Templets are made of wood or iron, the first usually, though not of necessity for cast-iron pipes chiefly; the second for pipes of copper or wrought iron. In each case the templets must retain their shape permanently, for if they don't the work done according to them will not be accurate. Nothing must be permitted to shift, and nothing must spring, therefore, rigidity and firmness are essential. We will consider the two kinds of templets in succession.

Templet Dimensions.

Before fitting a templet into place, dimensions are, if possible, taken overall between flanges, or from the centre of one pipe to the face of that with which it has to connect. How this is done depends on the relationship of the pipes. Usually, the aids employed besides a rule are the spirit level, the plumb bob, the parallel straight-edge, and the plumb line, or plumb rule. Distances may be taken in the manner shown in figs 1 to 4, which are typical of numerous cases.



Fig. 6—Fitting pipe templets.

In fig. 1, two pipes have to be connected by a diagonal pipe, or an S-bend. The distances of flanges and centres are taken in the vertical direction from a parallel straight-edge laid in the bore of one, and set horizontally with a level, and in the horizontal direction from a plumb line hung from the face of the flange, or from a straight-edge set vertically from the lower flange as indicated in dotted outline.

In fig. 2, measurement may be taken from the straight-edge to the face of the flange for vertical distance, and for the horizontal, from the centre of the plumb line to the centre of the flange as shown.

In fig. 3, a plumb rule is dropped, from the vertical flange whence measurement is taken, to the face of the other, and the vertical distance is taken from a straight-edge in the bore of one pipe to the centre of the other. In fig. 4 straight-edges alone are shown as aids to measurement. When dimensions are taken thus, the templets are prepared by one of the methods mentioned, as seems most suitable, and the exact fitting is done between the flanges, using a plane to effect the corrections on the faces of the latter.

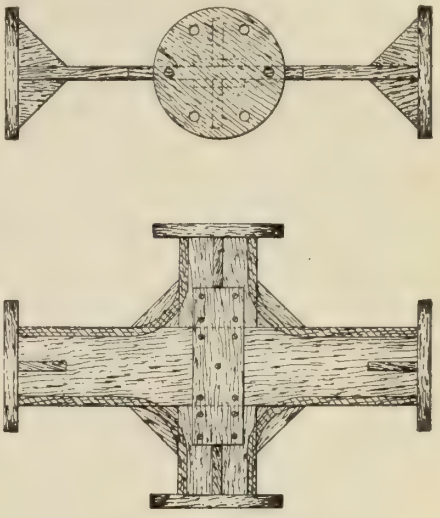


Fig. 8—Fitting pipe templets.

Cast Iron Pipe Templets.

Wooden templets comprise the stem or body, and the flanges (or spigot or socket in some cases.) The stem may be a mere strip, or it may be made wide enough to represent the outside diameter of the pipe, on which also the bore may be marked. Unless it is desirable to have these particulars, a narrow strip will serve the purpose as well as a wide one, its function being to give the correct positions of the flanges in regard to distance over all, and their fitting against the flanges with which

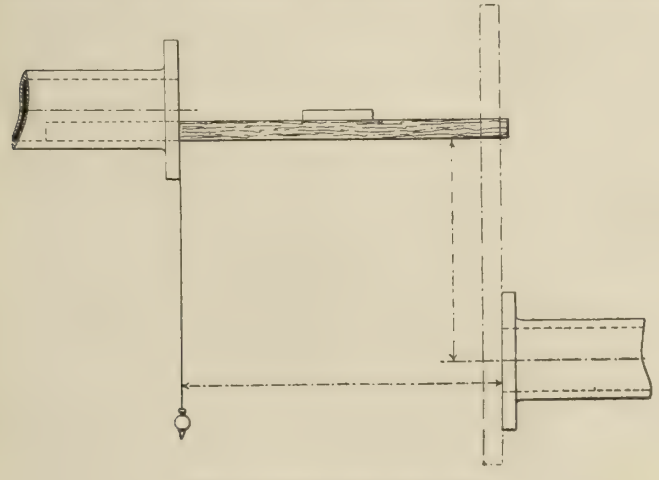


Fig. 2—Fitting pipe templets.

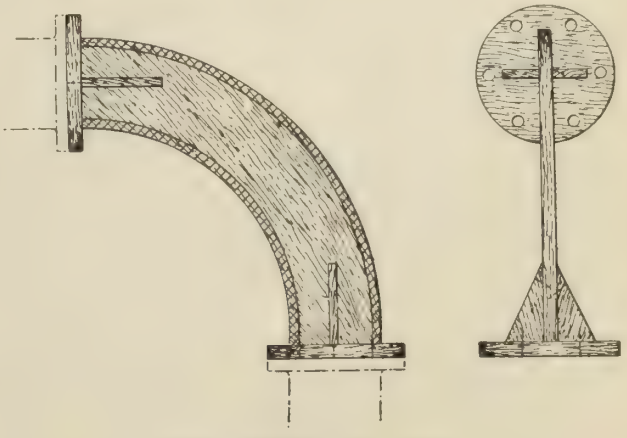


Fig. 5—Fitting pipe templets.

they make contact, either square or at some angle.

The material used ranges from $\frac{3}{8}$ in. to $\frac{3}{4}$ in. thick; white and red deal or yellow pine being suitable. The flanges are sawn to the circle with a band saw, and nailed or screwed against the ends of the stem portion. To prevent them from shifting, brackets are nailed or screwed both to flanges and stem in the manner shown in the various figs. The templet is thus rendered rigid as a whole. Slight final corrections of the flange faces will probably have to be made with the smoothing plane since the fit here must be exact. Bolt holes are marked through from the existing flanges to the templet, and either left as marked, or bored with a centre-bit.

Fig. 5 shows a templet for a bend pipe with bracketed flanges, bolt holes marked or bored, and with the thickness of the metal indicated. Fig. 6 is a bend templet formed of two strips halved or simply placed one on the other, and screwed together. On this the radius on the centre line is stated, and the outer one is, of course, struck from the same centre as the inner. The thickness of metal is also stated. In fig. 7 the radius of the throat of the branch is drawn, and the thickness of metal marked. In the tee-piece fig. 8, the same particulars are entered.

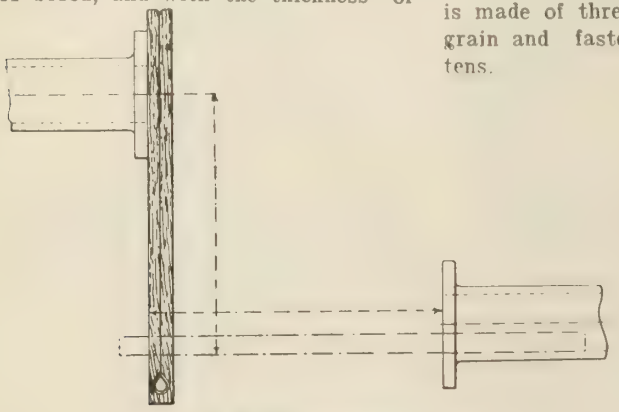


Fig. 3—Fitting pipe templets.

Figs. 9 and 10 show how the strips of templets for connecting pipes can be united with battens. These do not necessarily give the shapes of the pipes between the flanges. They may be of combined bend and tee form, as in fig. 9. In fig. 10 a double bend or an S shape may be adopted. Fig. 11 would be an S pipe.



Fig. 9—Fitting pipe templets.

The patternmaker should write on the templet all particulars of this kind, and strike out the actual shape on a shop drawing board. Fig. 12 shows a templet for a Y pipe connecting three pipes. It is made of three pieces to avoid short grain and fastened together with battens.

Fig. 13 illustrates the templet for a socketed-branch pipe, with the curves of the throat and the thickness of metal marked everywhere. Fig. 14 shows how a templet for a Y-shaped pipe may be fitted to a socketed pipe and to two spigoted pipes, after which the thickness may be marked on the templet, or simply stated in writing. Actually, the fitting to the socket and spigots determines all the dimensions, since these are standardized in all such work.

When pipes fit around vessels or round other pipes, it is essential to cut the stem portions to the shapes and dimensions of the castings, fig. 15, otherwise, the pipe, when made, may foul existing erections. There is a large percentage of such cases in pipe fitting, and diagonal pipes must often be dealt with in like manner to secure clearances.

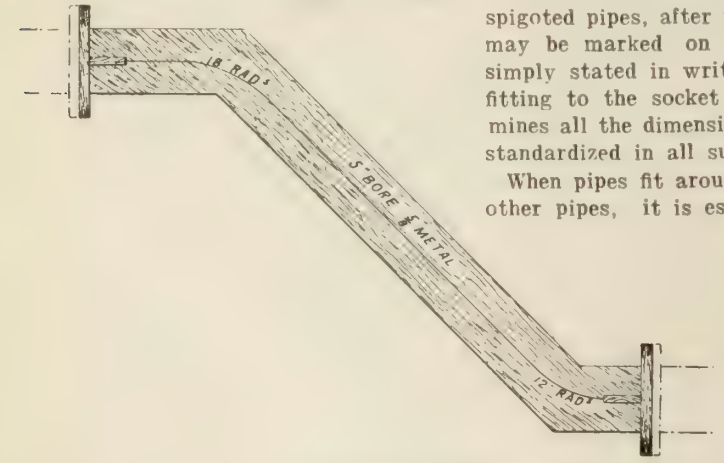


Fig. 11—Fitting pipe templets.

A careful man will mark the thicknesses of metal cross-hatched, as illustrated in several of the diagrams. This is not only helpful to the patternmaker, but also to the moulder in some cases, for as work of this kind is not of a set or standard character, it has to be done with make-up pattern parts, or in the larger pipes, swept up in loam with strickles. The templet, then, being sent into the foundry with the strickles, serves as a reference and guide to the core-maker and moulder. The same templet also goes afterwards into the machine shop as a guide for drilling the bolt holes. Finally, the templet may be kept in the stores for future use if the work is likely to be repeated, or repairs or spare parts wanted, though as a rule it is broken up after it has served its purpose.

Copper and Wrought Iron Pipe Templets.

Templets for copper and wrought iron pipes are usually made of iron rod to which sheet iron flanges are riveted, fig. 16. The rod must be large enough to be rigid, being usually $\frac{3}{8}$ in. or $\frac{1}{2}$ in. square. When that is not rigid enough, wooden templets are made, although seldom necessary. Less exactitude is required in these templets, because copper pipe admits of a considerable amount of corrective setting and bending, and wrought iron pipes only in a slightly less degree. In the latter, the make-up is often done with elbows, springs, sockets, and other fittings which admit of a fair range of adjustment. Also, in this work, flanges are brazed to copper and screwed on

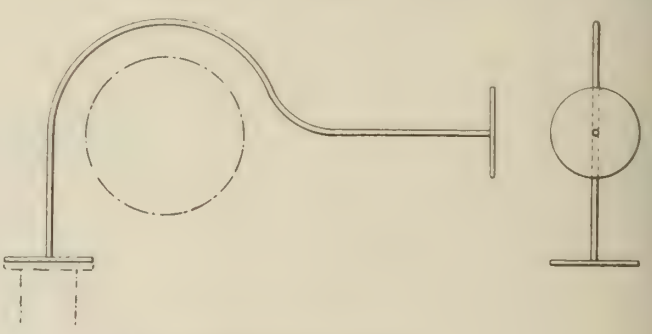


Fig. 16—Fitting pipe templets.

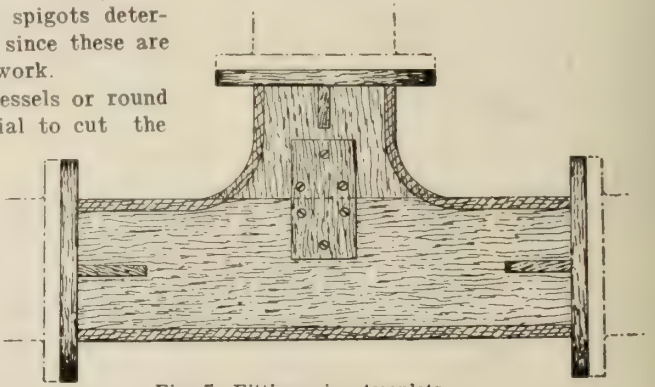


Fig. 7—Fitting pipe templets.

iron pipe, circumstances which again aid adjustments somewhat.

Transferring Measurements.

When transferring dimensions from templets to pipes or pipe patterns, either right or wrong methods may be adopted. It is not usually sufficient to lay the pattern and templet together, though that is done for a final test. Centre lines and flange faces must be worked from, hence, a patternmaker lays down centre lines on the stem of the templet, starting from the centre of the flanges. In iron templets, this need not be done if the iron stem occupies the centre of the templet.

Another method, which is available in either wood or iron templets, is to take measurements from centre to faces of flanges, the face of one flange being laid on the marking-off table. This is perfectly accurate. The measurements can be transferred to the casting by lining-off, and be checked again after tooling.

Drilling Bolt Holes.

Care has to be exercised in drilling bolt holes. One should not assume that they start on a centre line as they may

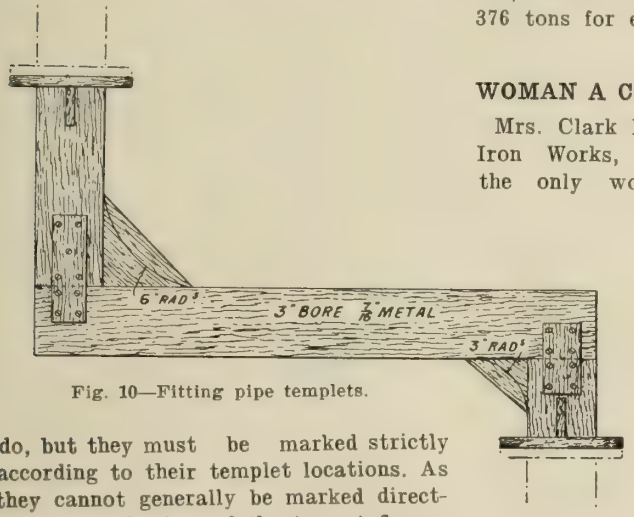


Fig. 10—Fitting pipe templets.

do, but they must be marked strictly according to their templet locations. As they cannot generally be marked directly against the face of the tempet flange, a piece of sheet iron or a piece of paper or mill board cut to the size of the flange can be laid against the face, the holes being marked, cut out, and used to mark the casting. Slight inaccuracies will occur in these, but they are corrected by the use of a hand reamer when the pipes are put in place. Sufficient clearance is often allowed in the holes to enable the bolts to be fitted.

COKE OUTPUT.

Of the 104,440 coke ovens in existence in the United States, as per the Bulletin of the Geological Survey, at the close of 1910, 8,373 were idle throughout the year. The number of idle ovens does not include those that were idle for a

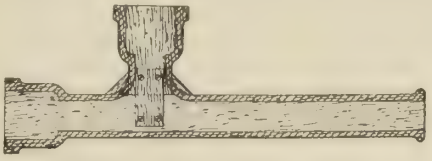


Fig. 13—Fitting pipe templets.

portion of the year only. In 1909, of the 103,982 ovens in existence, 8,501 were idle throughout the year. The number of ovens in blast for the whole or a portion of the year 1910 was 96,067, of which 92,016 were beehive or partial combustion ovens and 4,051 were retort or distillation ovens. The 92,016 beehive ovens produced a total of 34,570,076 short tons, or an average of 376 tons for each active oven.

WOMAN A CAPTAIN OF INDUSTRY.

Mrs. Clark Fisher, head of the Eagle Iron Works, Trenton, New Jersey, is the only woman member of the National Association of Manufacturers. Mr. Wu Ting Fang, ex-minister from China, called her "the most wonderful woman in America." "Though I liked machinery even when a child," said Mrs. Fisher, "it was my husband's illness and the desire which every woman has to help in an emergency that led me to enter the Eagle Works, of which Mr. Fisher was the head. I went in as the 'boss'; but I soon learned that if I was to be respected by my employes, I would have to know more than they did. To this end, I began as a regular apprentice, learned to temper steel, chisel the face of an anvil, mold vises and make rails. In fact, I took a complete course in every department of the business, from melting pig-iron to bidding for contracts. Before I was through, I learned really to love the work with iron and steel, the whir of the machinery, and the sound of the forge."

In 1902 Mr. Fisher was killed in a railroad accident, and Mrs. Fisher's life was saved only by careful nursing. Upon her recovery, she went back to her post at Trenton; and donning a loose blue working frock, she went to work to straighten out a state of affairs which would gave daunted the bravest-hearted person. Her employes had struck, the Delaware River had overflowed its banks, the shops were flooded, the machinery was rusting, and everything was in a state of confusion. Using great tact, she persuaded the hands to return, and set the factory to rights in short order.

Mrs. Fisher's business acumen was shown when she outbid all male competitors for the contract of furnishing anvils and vises for the Panama Canal

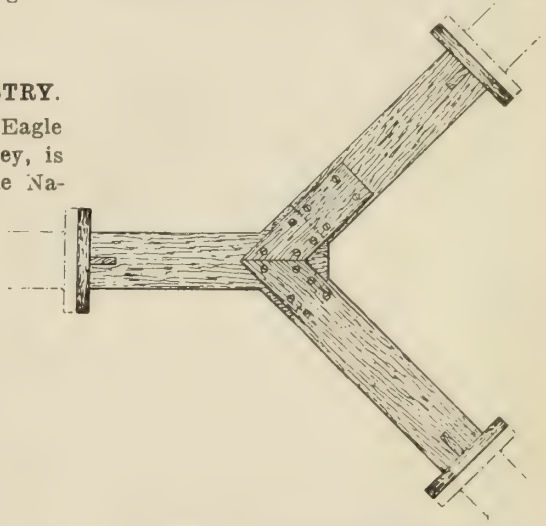


Fig. 12—Fitting pipe templets.

work. As a result of her untiring efforts and her ability, she is to-day a recognized "captain of industry," with a fortune mounting well up into seven figures.

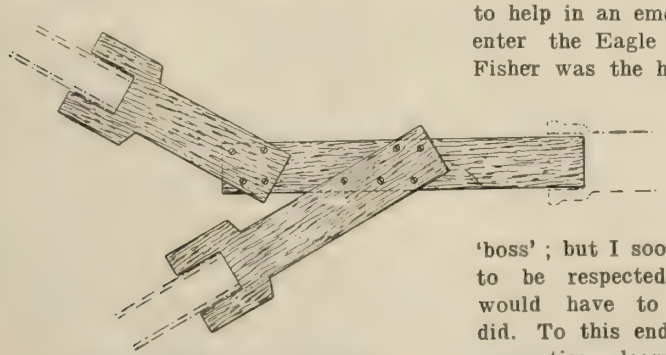


Fig. 14—Fitting pipe templets.

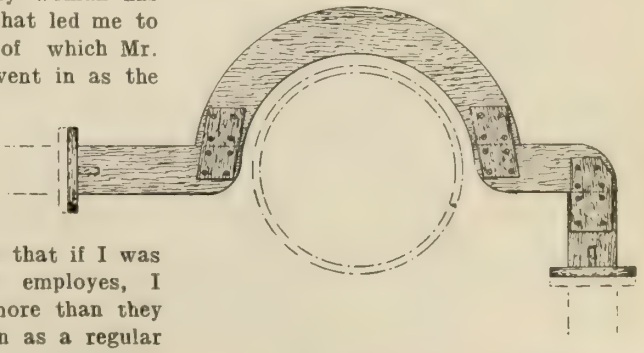


Fig. 15—Fitting pipe templets.

KNOTS AND TACKLING.

Deckhand.

TO most men engaged in manufacturing, erecting and building, has come the necessity of making a knot which will hold permanently if need be, of making a reliable but easily applied temporary connection, or of having to sling some piece of machinery for lifting or lowering to some other level. In the domestic sphere there is an oft repeated call for the exercise of "knotology," and who of us has not blundered through the work, adding knot to knot, increasing as it were safety where it is impossible to do so, wasting rope as regards quantity used, and further by cutting asunder when the package or connection wants undoing. Have you ever noted the perspiration of excitement and exertion break on the face of a novice in knots? or again, have you ever gazed with astonishment at the calm, easy and seemingly careless manner of an expert? The work of the latter takes seconds for the minutes of the former to accomplish.

The purpose of this brief article is to bring before our readers the opportunity of becoming intimate with the methods adopted in making knots.

The sketches Fig. 1 show those commonly used, each of which is simplicity in itself, easy of application and reliable in effect. They are shown open, in other words are not drawn taut, the idea being to convey the method of their formation better. As an aid to those who wish to master the intricacies of knot making, it should be a basic principle that no two parts which would move in the same direction if the rope were to slip, should lay alongside of and touching each other.

The sketches Fig. 2 show the commonly used forms of tackling, and to those having erection work to do, the various items shown and self-explanatory, will be found serviceable and safe. It is a matter of common knowledge that probably not one man in twenty can make reliable knots or rig up satisfactory tackling if called upon. The art, for such it is, does not somehow appeal to them as a valuable asset, but is looked upon rather outside their particular field, and a purely nautical necessity.

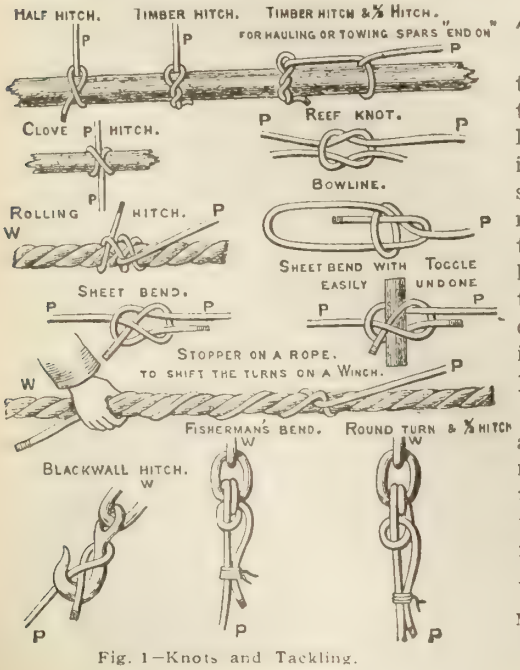


Fig. 1—Knots and Tackling.

The practice in many instances is to employ a ship rigger or sailor to care for lifting, knotting, tackling and slinging required. The opportunity to learn is well worth taking advantage of by everyone, particularly as the means of experimenting, a few feet of cord, and the leisure to do it, are within the reach of all.

To the onlooker the artful manner in which an expert does his work, gives rise to the impression that the operation is too simple to be effective, and he fears the dire results that are sure to follow the particular effort being carried out. The idea that knot upon knot, twist, half hitch and loop need be multiplied to give quantitative appearance, dies hard.

Simplicity in most cases commends itself, being more economical and surer in results. Knotting and tackling call for the utmost simplicity, just as much and possibly more so than most things, but to attain that desired end, a more general cultivation of familiarity with them should be considered an essential part of every man's brain and hand equipment.

NORTON COMPANY'S MEDICAL DEPARTMENT.*

By Dr. Irving Clark **

THE Norton Company established its medical department during the latter part of May, 1911. The step then taken was the outcome of two ideas:—First, that a medical department would increase the efficiency of the employees; second, that it would increase the already well-marked good feeling between the men and the company. As the belief, that increased efficiency may be obtained by caring for the physical condition of employees, is somewhat new, its basis will be sketched.

Health a Factor in Labor Efficiency.

In the consideration of production in any given department, practically every mechanical item can be accurately estimated. It would be possible to figure the exact cost and output of any department, provided that all the work in that department, even to the minutest detail, were done by machinery; that is, provided that the human element could be eliminated. It is this human element which cannot be accounted for and which, therefore, should be given very close attention.

To obtain maximum results, for the work at which it is engaged, the human material must be maximum quality, and maximum quality in factory employees means perfect physical health. The problem of health, therefore, assumes a new proportion in considering efficiency, and we might say that if every man employed were physically well, all departments would run with the utmost smoothness and production. To produce such an ideal condition is of course impossible, but an approach to the ideal is quite possible.

System of Investigation of Health Problem.

In an attempt to investigate this problem the following steps would seem rational, and have been adopted by the medical department.

1.—Complete physical examination of all employees.

2.—Immediate attention to all defects found at examination, and an effort made to rectify same.

3.—Re-examination at regular intervals of employees having physical defects, to see that they are in the best condition possible.

4.—Immediate attention to all employees incapacitated by injury or illness, and an effort made to get them into normal condition in the shortest time.

Anticipated Beneficial Results.

The practical results of such a plan if systematically carried out should be as follows:

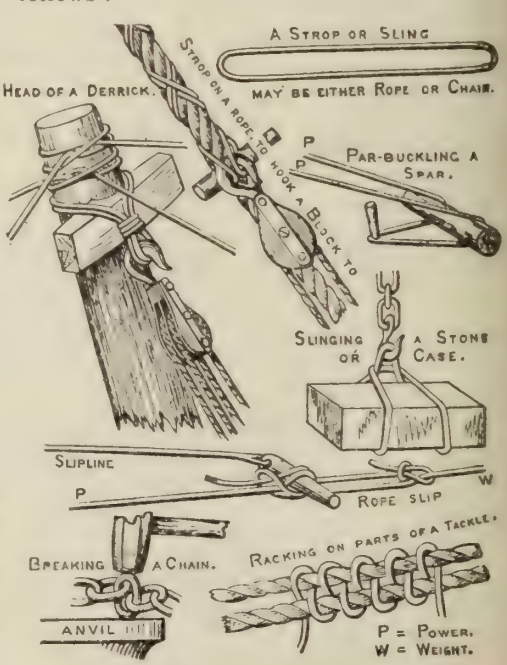


Fig. 2.—Knots and Tackling.

* Abstract of paper read at the National Machine Tool Builders' Convention, New York.

** Norton Company's medical department.

1.—Immediate elimination of those absolutely unfit for work.

2.—An increase in the capacity of the partially unfit by slight changes in work, medicine, mode of life, etc.

3.—An exact knowledge of those who may become partially or wholly unfit, and a continued effort to keep this from occurring.

4.—A prevention of sickness by advice given to well employees and by immediate attention to slight ailments.

5.—(a)—A reduced time of recovery from accidents. Wounds and injuries properly treated at once heal very much more quickly than if treatment is delayed.

(b)—The elimination of so-called blood poisoning, by proper treatment of wounds.

6.—The elimination of active tuberculosis, syphilis, or any condition dangerous to other employes.

The outfit and method of the medical department in its effort to carry out this plan, and the results up to the present time, are as follows :

The Hospital.

This consists of a room of moderate size, well lighted and ventilated by two large windows, and having a carefully selected equipment. It contains a desk, an instrument cabinet, a glass-top table for dressings, a sterilizer for instruments and dressings, and an examining table. Beside this, there are numerous solution bowls, instruments, dressings, etc. In short, it is a minature dispensary.

Tho Physician.

The doctor gives about three hours a day at the factory ; about an hour and a half in the morning and the same length of time in the afternoon. In the morning he examines all sick employees applying for treatment, and either prescribes for them, or, if they are sick enough to have to stop work, advises them to call in a physician. In the majority of cases, however, the men have minor ailments, which readily yield to simple treatment. The afternoon is devoted almost exclusively to making physical examinations.

Functions of the Medical Department.

These are three in number :

1.—The care and after treatment of all accidents occurring to employees.

2.—The complete physical examination of every employee, and an attempt to remedy all existing physical defects.

3.—The examination, diagnosis and advice of all employees complaining of any sickness whatever.

These three functions considered in detail, show what has been accomplished.

Care of Accidents.

Despite a committee of safety which is continually introducing new methods of prevention, a large number of accidents are bound to occur in any large factory.

In the majority of cases, if these accidents receive prompt and efficient care, they prove merely an inconvenience to the employe, perhaps preventing his work for 48 hours, but seldom longer. Even the smallest wound or scratch, however, if it becomes infected, may lead to a long and sometimes serious illness. Therefore, prompt attention and thorough cleaning of all wounds become a matter of prime importance.

It is also important that an employe receive immediate attention by some one in the department in which he is working, and that he be removed as quickly as possible, in order not to break up the work of other employes. Bearing these facts in mind, the Norton Company devised the following method :

Once a week for ten weeks, all the foremen of the different departments were called together, and the doctor gave a thirty minute talk upon the various accidents most frequently met, and their immediate treatment.

The subjects lectured on were as follows :

1.—Hemorrhage and its treatment.
2.—Burns and bruises.
3.—Lacerations and cuts.
4.—Sprains.
5.—Fractures and dislocations.
6.—Infections (blood poisoning) and treatment.
7.—Resuscitation from gas, fainting, etc.

Each lecture was made as simple as possible, and was illustrated by blackboard drawings and actual demonstrations, such as putting on bandages, splints, etc. At the end of this course of lectures, an oral examination was held, and since then, there have been examinations and conferences about once a month. The foremen have shown great interest in this part of their work, and have ably demonstrated their ability to apply the principles they have learned. At the present time, the foremen are coming three at a time to the doctor to put on bandages under his supervision.

Each foreman is provided with a first aid jar containing

Three bandages of different widths.
One package of sterile gauze pads.
Three finger splints.
One tourniquet (rubber).
One measuring glass.
One bottle of aromatic spirits of ammonia.

The jar has general directions on the outside, and there is, in addition, a card of first aid directions posted in each department.

When an employee is injured, the following is the routine :

1.—Foreman administers first aid and notifies main office.

2.—Main office notifies doctor and trained dresser.

3.—Patient is conveyed to the hospital, where dresser prepares case for doctor's examination and treatment.

4.—Doctor arrives at the hospital and cares for the case.

All cases of foreign body in the eye are cared for by the doctor in person. When the body is a particle of steel or Alundum, which has penetrated the clear part of the eye, the eye is dressed and the patient sent immediately to an occulist for operative removal. Unless treated with the greatest care, these cases are apt to result in permanent injury to vision.

While our system for caring for accidents has not been in force long enough to make any statistical statement, we can say that no clean injury has become septic, and that no employe has been obliged to be absent from work more than a week, except two very severe eye cases. In the majority of cases, the patient has been able to return to work immediately after treatment.

The type of injury met at the factory may be seen from the following list, which is of the injuries received during the past three months :—Wounds, 28 ; crushing injuries, 11 ; sprains, 5 ; foreign body in eye, 13 ; miscellaneous, 14.

An examination of these statistics shows that, while there are practically no serious injuries, there are many which if not properly cared for, may lead to considerable loss of time. By the method outlined, all injuries receive prompt and efficient attention, and subsequent dressings are done by the doctor until the patient is entirely cured.

Physical Examination of Employes.

The physical examination of employes is rather a new departure, but to our minds is the corner stone in building up physical efficiency. Each employe receives a complete physical examination, for we believe that, unless a physical examination is so, it is of little value, because impossible to foresee where weakness may appear which will have a definite effect upon the employe's efficiency.

Each employe is, therefore, examined carefully for defects in all organs, and the results entered upon a card. Any abnormal condition of the chest, back, or abdomen, is charted on the card diagram.

After examining a man, the doctor discusses his physical defects with him, and strongly urges him to attend to any weakness. Thus men having ruptures are advised trusses. Those with poor teeth

are advised to go to a dentist, and all are instructed in the importance of care of the teeth. If any minor disease exists, advice is given, with prescriptions if necessary. The employe is told to report again in two or three days as the case requires. Where there is reason to suspect pulmonary tuberculosis, a sputum examination is made, and where the kidneys are suspicious, a urinalysis is done. We expect to make a complete urinalysis on all employes over 40 years, but have not started this work yet. If the employe examined is too sick to work, he is sent at once to his family physician.

It will be seen from this that every attempt is made to get the men in perfect physical condition to start with. But this is not all. When an employe is found to have a weak heart, and is doing work injurious to that heart his work is modified. When a man has a double rupture he is not allowed to do very heavy lifting, etc. Men found having organic disease are required to report at varying lengths of time for examination and advice. In this way, the weak spots of the human machinery are kept under close supervision, and any rapid degeneration prevented.

Results Encouraging.

The results of this side of the work have already been most encouraging. The men take a great deal of interest in their personal condition, and are quick to appreciate the relief afforded by the simple remedial measures adopted. We have had but one objection in the course of six hundred examinations, and the majority of men thank the doctor on leaving the hospital. When a man has once been examined, he is pretty sure to return for advice at his first subsequent sickness.

By his examinations and subsequent intercourse with the employees, the doctor is able to get in very close sympathy with his patients, and they discuss many things with him freely. He is thus able to use his influence to prevent the minor vices, such as over-smoking and late hours among the younger men, and, in several cases, has had very gratifying results in his efforts to keep valuable men at steady work who have a tendency to "sprees." Working men will listen to advice from a doctor, and what is more, follow it, when from anyone else it would prove of no avail whatever. The moral power of the doctor must necessarily become greater as time goes on, and the men become more and more convinced of his good faith and interest in their physical welfare. The defects found have been divided into three classes—Medical, Surgical and Special sense, and total, 113, 209 and 276 respectively.

We now come to the third function of the medical department which consists in examining and advising all sick employes.

Dispensary.

Previous to the establishment of the medical department, a sick employee saying he was unable to work was allowed to go home. Now he must apply to his foreman, and is then sent to the hospital. There the doctor examines, advises, and prescribes for him. Often it is found that one of the simple remedies which are used at the hospital, will give such immediate relief that the man is able to return to work. If, on the other hand, a really serious condition is discovered, the man is sent home, his physician notified, and everything done to get him under proper care at once.

In connection with the dispensary the foremen are provided with "sick slips," which they fill out in all cases of injury or sickness, giving the date of absence from the factory, and the number of days or hours of lost time. These are filed by the doctor, and the length of absence and cause noted on the original examination card. When the man has left the factory without seeing the doctor, he is sent for on his return, and the cause of his absence obtained. This is then noted on the "sick slip."

All physical examinations are filed by name, and two lists are kept, one of normal men, the other of those having defects. By this system the exact physical condition of each employee is known, as well as any sickness or accident he may have had; and the length of time he has lost by each. By turning to the "sick slip" file, the number of cases of sickness or accident in any department may be immediately seen, as well as the names of the men, the disease or accident causing the absence, and the amount of time lost.

The dispensary function of the hospital is growing in popularity among the men, and it is hoped that the intercourse between doctor and employes will promote additional good feeling between the employes and the company.

The medical cases which have been treated during the past three months number 63.

In closing, we would have it distinctly understood that this is only what would be termed in medical parlance a preliminary paper. The work has been going on only six months, and the development has naturally been slow. It will be several years before statistics can be obtained to show whether or not efficiency has been promoted. However, as far as we can judge from the small amount of data at hand, there is good reason to hope that ultimately a high degree of physical efficiency may be achieved, as well as a closer sympathy between the employes and the company.

U. S. COAL PRODUCTION IN 1910.

The coal mines of the United States were credited in 1910, with an output of 501,576,895 short tons of anthracite, bituminous coal, and lignite. This great output was attained in spite of the fact that most of the coal mines in Illinois, Missouri, Kansas, Arkansas, and Oklahoma were closed for nearly six months by one of the most bitterly contested strikes in the history of the industry. The greatest tonnage mined in any other year was in 1907, when a total of 480,363,424 tons was produced. Compared with 1909 the output last year showed an increase of 40,762,279 tons, or nearly 9 per cent. This increase was equal to 20 per cent. more than the entire output of the United States in 1870.

GROWTH OF ENGINEERING SOCIETIES.

The statistics of the important engineering societies of the United States and Canada show that the growth of the four principal engineering societies in the past five years has been as follows: —American Institute of Electrical Engineers, 7,118, an increase of 3,524; American Society of Civil Engineers, 5,976, as compared with 3,569 members in 1906; American Institute of Mining Engineers, 4,200 instead of 3,886; and American Society of Mechanical Engineers, 3,899, an increase of 970. Five years ago the American Institute of Mining Engineers was the largest society of the four, but it has receded to the third place, its increase being the smallest of the four, only 314. The National Electric Light Association has increased its membership by about 1,000 in the past few months; it had 923 members in 1906, and now has over 9,000. The American Iron and Steel Association is credited with a membership of over 200 corporations and companies, the American Iron and Steel Institute with 315 members, the American Museum of Safety with 100, and the American Society for Testing Materials with 1,350 members.

One of the features of the statistics is the increase shown in the number of State engineering societies, and of sanitary engineering and water supply associations formed during the past five years. Among the more prominent new societies formed in that period are the American Institute of Chemical Engineers, American Institute of Consulting Engineers, American Metallurgical Society, American Society of Agricultural Engineers, American Society of Engineering Contractors, International Railway Fuel Association, Inventors' Guild, and the Mining and Metallurgical Society of America.

The Georgian Bay Canal and the Transportation Problem

By J. M. Shanly, M. Can. and Am. Soc. C.E.*

The Writer of This Article is Well Qualified to Express an Opinion as to the Advisability and Necessity of This Great Project of the Georgian Bay Canal, and His Clearly Drawn Comparisons and Detail of Costs Go to Show the Need There is for Caution Before Any Government of this Dominion Embarks on the Scheme.

WITH the opening and rapid development of our great grain producing areas in the Northwest, the question of cheap transportation to the seas becomes of greater importance every day, and naturally the project for a canal from the Great Lakes to the St. Lawrence, by way of the valleys of the Ottawa and French Rivers, is arousing interest among all classes of people. This route seems to have been especially designed by nature for such a waterway. The Indians in their canoes used it before the days of white men on this continent.; the early French explorers traveled it before they knew anything of the route, via the St. Lawrence, Lakes Ontario and Erie ; and, in the days before railways had become of great importance in the development of the Dominion, it was examined and reported on, for canalization, as an improvement over that then in use—via the St Lawrence and the lakes.

It is still a moot question whether the interests of Canada would be better served by the construction of a canal by this route, or by enlarging and improving the St. Lawrence and Welland Canals. Both propositions have their good points. It is not the object of this article to take up the discussion of the merits of these respective propositions, but rather to consider whether or not canals and artificial lines of navigation are the best possible solution of the transportation problem.

Railroad Development.

When the Georgian Bay Canal project was first discussed, canals were the chief means of communication between inland points, there were few railways in existence, and these were little better than short tramways with light iron rails, small cars and light locomotives. Operated by small, independent companies, freight rates were high and the service poor and uncertain. Under such conditions, canals were preferable in every way. In the half century or more since elapsed, railways have been steadily improving ; light iron rails have given place to steel, wooden cars of 15 or 20 thousand pounds capacity, have been replaced by steel cars capable of carrying 60, 80, or 100,000 pounds of paying freight ; locomotives have doubled and trebled in size and hauling capacity, and the old, more or less, disconnected tramways have become great trunk lines, stretching from ocean to ocean, and making such connections, that freight can now be loaded at almost any point on the continent and sent through to any other point without transhipment, and at rates undreamed of in the old days.

The end, however, has not yet been reached, for the great trunk lines are spending millions of dollars every year in cutting down grades, putting in extra tracks, and improving both road-bed and rolling stock, with the object of still further reducing the cost of transportation. New types of locomotives are being designed, each a little larger or better than the last, and people are even now discussing the possibility of increased economy by doing away entirely with the old familiar steam engine, and substituting for it the electric motor. A few years ago the canal was far ahead of the railway as an economical freight carrier, now they are probably on about an equal footing. What will be their relative positions in another decade ?

Georgian Bay Canal Report.

In response to popular demand, the Dominion Government has recently taken up the question of the Georgian Bay Canal, and a most thorough and complete survey has been made of the whole route. The report of their engineers is a model one, and covers the ground completely, leaving nothing, in connection with the scheme, to be guessed at or taken for granted. Detailed estimates of the cost of each section and accurate figures as to the ultimate capacity of the canal, based on the supply of water available at the summit, are given. From this report, we find that the cost of completing the canal will be, in round figures, $100,000,000. The annual cost of operation and maintenance, $900,000, and the estimated probable capacity, 15,000,000 tons per annum.

The capacity of three locks at Sault Ste Marie is given at 75,000,000 tons annually ; that of the Georgian Bay Canal may be therefore, put at one third of this, or 25,000,000 tons, as an absolute maximum. For many years to come the preponderance of the traffic will be eastward, and vessels coming down fully loaded would go back with half loads or less. On this basis, the paying traffic would be under 20,000,000 tons per annum.

Capacity Comparison With Railroads.

A double track railway line, with elevators and other terminal facilities complete and with maximum grades not exceeding 3-10 per cent., could be built and equipped from Montreal to the Georgian Bay, say 380 miles, for, at the outside, $30,000,000; or less than one-third of the cost of the canal. Over this line an ordinary consolidation locomotive could haul a net paying load of 2,300 tons, and, assuming as in the cost of the canal, that one-half the cars went back empty, an average load of about 1,700 tons. With one train each way per hour, the capacity of the line would be 24,500,000 tons per annum, or during the season of navigation, 16,500,000 tons. Trains could no doubt be run at shorter intervals than this, but no increase could be made in the number of vessels using the canal, so that the two systems would be about on an equality as regards capacity.

Freight Rates.

Owing to the fact that steamers bringing grain and iron ore down to Buffalo, can get return cargos of coal, etc., the freight rates are lower to that port than they would be by the canal route to Montreal. The rate from Fort William to Buffalo may be taken at about 50 cents per ton ; on the same basis, the rate to Montreal by the Georgian Bay Canal route would be about 80 cents, but the difficulty, at present, of securing full cargoes for the return trip, would necessitate this being increased to about $1.

The steamer rate from Fort William to a port on the Georgian Bay, including transhipment at the latter point, might be figured at about 55 cents per ton ; this deducted from the canal rates leaves 45 cents per ton for the charge on our proposed railway end of the business. We will take as a basis, the returns of the Canada Atlantic, which runs through the same section as our proposed line. In 1909, the cost of hauling a freight train one mile on this road, was practically $1.25. At this rate, the cost of taking a train, carrying an average load of 1,700 tons, over our 380 miles of line, would be $475, or 28 cents per ton, leaving a margin of 17 cents per ton for bond interest, etc. Whether the earnings would be sufficient to cover all fixed charges, would of course, depend largely on the volume of the traffic ; but.

* Civil Engineer, Montreal.

putting the rate of interest on bonds at 5 per cent., the total annual fixed charge would be $1,500,000, and a traffic of 9,000,000 tons would provide that amount.

Allowing 4½ per cent. interest on the cost of the canal, and $900,000 a year for maintenance and operation, its total annual charges would be $5,400,000, to meet which a greater freight charge, than the $1 per ton above mentioned, would have to be made, or an additional tax put upon the country at large.

Coal from the lower provinces and traffic of that class could no doubt be taken through more cheaply by canal than by rail and water, owing to the saving of cost in handling and diminished deterioration losses, but, so far as the traffic in grain and food stuffs is concerned, the railway would have the advantage. The canal would, in government hands, act as a regulator of freight rates ; but so would a government owned railway. Both propositions would open up new sections of the country, and tend to encourage local industries. The construction of the canal would develop enormous water powers ; but these can be developed as well, and at much less cost, without the canal. As things stand at present, it is a fairly even race between rail and artificial navigation.

The Canal Value Still Uncertain.

What the future may have in store can be only guessed at ; but, while the canal is limited in its capacity by the available water supply at the summit, the railway is capable of practically unlimited expansion by the construction of extra tracks and improved terminals. The canal, as designed, is capable of accommodating much larger vessels than the average freighters now in use on the lakes ; the railway could also use more powerful engines than those figured on here, and thus largely increase the size of its trains. As an example, there may be cited the "Mallet" Compound Locomotives, recently built at the Angus Shops of the C.P.R. These engines can haul one hundred cars each loaded with 30 tons, over the 3-10 grades of our supposed railway, increasing the assumed train load nearly one-third, on very slightly increased cost.

In conclusion, the writer does not wish to be classed as an enemy of canals, which have in the past been of immense value to the country, and which will no doubt, continue to be so for a long time to come ; but the development of railways has now reached such a stage, that apparently the old time pre-eminence of the canal has disappeared, and therefore, he is of the opinion that such an enormous undertaking as the construction of the Georgian Bay Canal should not be commenced until all alternative schemes have been carefully studied.

FINANCES OF CANADA.

A statement of the public accounts for the last fiscal year shows receipts of $117,780,409.78, and expenditures of $87,774,198.32, leaving an apparent surplus of $30,006,211.46 on consolidated account. An additional outlay of $30,852,563.38 is shown on capital account, including $23,487,986.19 spent on the transcontinental railway, $1,597,663.48 on bounties, including iron and steel, $1,138,748; lead, $248,534; binder twine, $49,784, and petroleum, $160,596. The debt increased $3,773,505. The Ottawa mint made a profit of $861,188 on its coinage of silver, and $34,827 on copper coinage. A further profit of $15,889 comes from the excess bank circulation during the harvest.

WORKERS TOO OLD AT FORTY.

That a man cannot get a new position after he is forty years old was asserted before the Employers' Liability and Workmen's Compensation Commission at Washington, by Arthur E. Holder of the American Federation of Labor. He had been speaking of the satisfactory operation of the British compensation act of 1906, which recently he had investigated, when a question was asked as to its effect on the employment of men of advanced age.

In reply, Mr. Holder said that regardless of this law there was a marked discrimination against the aged—not only in Great Britain, but throughout the industrial world. The man who is over forty and who has a few grey hairs, cannot get back when he once loses his job, but he can hold on if he has a place," he said. "It is the same here as it is in England, and it is the same in Germany and throughout the continent." This condition was not due, said Mr. Holder, to any legislation, but was the result of economic conditions and came from the determination to get the greatest amount of product out of the human being employed.

With reference to the extent of compensation for death or injuries, Mr. Holder said he thought the law should grant "all that the traffic will bear." He declared no death benefits should be less than $5,000, and no injury award less than a dollar a day, regardless of the ordinary compensation of the injured employee.

STEEL TUBING.

The Customs Department recently issued an order respecting certain classes of steel tubing. It provides that the dumping duty of 1907 shall apply, without any exemption allowance, to iron and steel tubing of from four to eight inches diameter of a class made in Canada. This is a tightening up of the dumping law as a slight measure of protection for Canadian industries. The same order places smaller sizes of tubing on the same basis as rolled rail and steel as regards the dumping law. The tax to be imposed where the difference between the fair market value and the cost to the Canadian importer does not exceed five per cent.

EFFECT OF TUNGSTEN IN TOOL STEEL.

While tungsten has been known for many years, its economic importance is of recent growth. The meaning of the name is heavy stone and its most important use, according to Frank L. Hess, of the United States geological survey, is an alloy for tool steel. Lathes equipped with tools made from tungsten steel may be speeded up until the chips leaving the tool are so hot that they turn blue, an operation that would spoil the temper of high carbon steel. It is stated that about five times as much work can be done with lathes built for such speed and work, as can be done by the same lathes with carbon steel tools. From 16 to 20 per cent. of tungsten is ordinarily used in lathe tools. The melting point of tungsten is 5,576 degrees Fahr. Tungsten also has important use in making filaments for incandescent lamps, crucibles for electric furnaces and various other articles.

OFFER OF PRIZE.

The Society of German Foundry Engineers, with headquarters at 60 Sybelstrasse, Charlottenburg, Germany, announces that it will offer prizes of 1,000, 500, and 300 marks ($238, $119 and $71.40) to the writers who will submit the best three treatises on the following question: "Have real advances been made in the construction and operation of cupolas during the last 20 years?" Full details regarding the contest may be secured by addressing the society.

Investigations have been made at the German official testing bureau for materials to ascertain to what extent repeated meltings of bearing metals influence their strength and reliability. As regards white metal (alloys of copper, antimony and tin) it was found that repeated meltings did not noticeably alter the grain, but that the rate of cooling had a considerable influence. Quick cooling yielded a finer grain and higher hardness and strength, and the investigators recommend that white metals should not be heated to high temperatures and that they should be cooled rapidly. Bronze, poor in tin, and, therefore, comparatively inexpensive, may have its hardness and strength increased by being rapidly cooled from a temperature of 1440 degrees F.

SYSTEMATIC BUSINESS MANAGEMENT

Practical Articles for Managers, Superintendents, and Foremen, to Assist in Carrying on the Business Economically and Efficiently.

AN AWARDS SCHEME.

THE William Denny Bros., Leven Shipyard, Dumbarton, Scotland, "Awards Scheme" was one of the first of its kind to be established, and has now been in existence for twenty-nine years. It has encouraged the men to take a greater interest in their work, and to study means by which output may be improved. The scheme makes provision for awards to workers, exclusive of head foremen or heads of departments, as follows:—

1. Inventing or introducing a new machine or hand tool.
2. Improving any existing machine or hand tool.
3. Applying any existing machine or hand tool to a new class of work.
4. Discovering or introducing any new method of carrying on or arranging work.
5. Generally, making any change by which work is rendered either superior in quality or more economical in cost.

The adjudication of the awards is in the hands of a nominee of the yard and of the engine works respectively, in collaboration with an impartial president from outside the firm. The committee make a money award, within certain limits, according to their estimate of the value of the invention, and if a workman succeeds in gaining five awards (which has been the case not infrequently) he is granted a sum of money equal to the amount of awards he as gained, and so on for every five awards. If an idea be sufficiently important to patent, the firm (in the event of the workman being unable to do so himself) look after his interests, in addition to giving him a special award.

During the time the scheme has been in existence a sum of about $12,500 has been granted in awards and premiums, and quite a number of highly serviceable inventions might be cited as being in practical use.

The Denny-Brace spark catcher has been largely adopted by shipowners, and is recognized as adding considerably to the comfort of those traveling on board ship.

A popular form of compact heating apparatus is the D.S.S. radiator, which is not only well adapted to ships compartments, but to railway carriages or other place where space is a consideration.

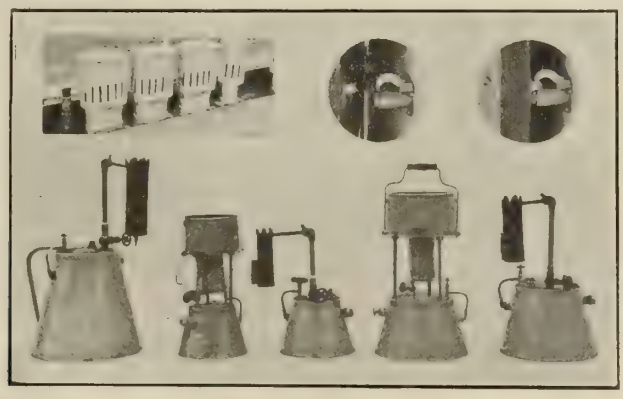
A simple, but very serviceable little invention is the Denny & Thompson combination door hook and buffer, by which an open door can be instantly and automatically secured, and easily released when required to be shut.

The Denny-Porterfield patent sidelights have been adopted by several leading steamship companies, and are found most efficient. They have the advantage of giving the largest possible lighting area for any given frame space, and, while water is efficiently excluded, the ventilating arrangements are complete and compact.

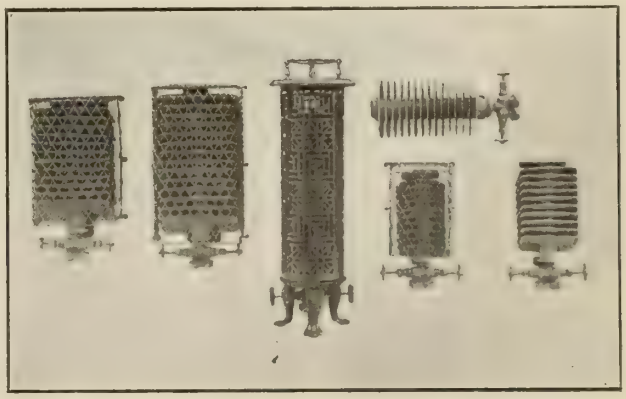
The Fyfe improved upcast ventilator has been on the market for many years, and is still largely in demand.

A highly important invention has lately been perfected by Archibald Denny and Charles Henry Johnson of the shipyard electrical staff, and is known as the Denny & Johnson torsion meter. By means of it, the torsion of revolving shafts may be ascertained, thus enabling the power transmitted to be calculated.

The accompanying cuts show in some detail a limited number of devices resulting from the operation of the foregoing awards scheme.



Wm. Denny Bros.' awards scheme—Fyfe ventilators. Denny-Thomson door hook.



Wm. Denny Bros.' awards scheme—D. S. S. radiators. Denny-Gourlay Lamps.

SCIENTIFIC MANAGEMENT.

THE U. S. War Department has given considerable attention to the utilization of methods of scientific management in the various arsenal shops of the government. The arsenal at Watertown has been used practically as an experiment station with a view of trying out the theory before applying it generally. There, a "planning" room was established which relieved the foreman of much clerical duty and insured a continuous flow of work without cessation and loss of time. Men were assigned to keep the tools of others sharpened, and laborers or messengers attended upon the higher priced machinists, who were thereby enable to devote their whole attention to production. Another set of men kept the plant in thorough order, so that it could be worked at its highest efficiency. Experts were employed to show the workmen just how fast their machines should run and how deep their tools should cut.

As a result, it is stated that it was possible to reduce materially the cost of manufacture. For example, the labor cost of one set of parts for a 12-in motor carriage was cut from $480 to $275, and corresponding reductions were made in other directions. A report on this experiment at the Watertown Arsenal has recently been made public, and in commenting on it, Secretary of War Stimson states that the results thus far are highly gratifying and full of promise. There has been an undoubted increase in

the efficiency of the workmen at the shop, and a material reduction in the cost of manufacture. At the same time, and to my mind, a matter of even greater importance, is the fact that these results have been obtained without in any wise endangering the interests of the workingmen, either by decreasing their pay or requiring unpleasant exertion or "speeding up." On the contrary, any increase in real efficiency must bring about larger benefit to the operatives.

PLANING MILL ELECTRIFICATION.

The latest addition to the list of electrically operated wood-working plants in the Canadian West is the mill and box factory of the Brunette Sawmill Co., Sapperton, B.C. The generating equipment is housed in a reinforced concrete building 25 ft. x 35 ft., equipped with metal sheathed doors, steel windows with wire-glass panes, and otherwise of fireproof construction.

The main generating unit is a 500 kv.a., 3-phase, 60 cycle, 480 volt, 3,600 r.p.m., A-C-B. steam turbo-generator, designed for operating condensing on 110 lbs. steam pressure. The turbine has a rated output of 670 h.p., and has twenty-five per cent. overload capacity. The exciter used in normal operation is a 15 kw. C. G. E. turbo-generator running at 4,500 r.p.m. A second small unit of 35 kw. capacity, A-C-B manufacture, direct-connected to a 9 x 10 Ideal engine, is normally used for the lighting of the mill and the operation of several small motors, but is also counted on as a reserve exciter in case of mishap to the smaller one.

The switchboard apparatus is of the pedestal type, installed by the Canadian Westinghouse Co. A Tirrill automatic voltage regulator is used. Four main circuits are laid from the power house, two to the planing mill, one to the box factory, and one to the saw-mill; the local distribution in each case being from a steel cabinet containing a slate panel upon which all the starting fuses for the various motors are mounted. The wiring is in steel conduit throughout, with approved condulet fittings. The motors for the most part are directly connected by flexible couplings to the machines they drive.

Mather, Yuill & Co., Vancouver, designed and supervised the installation.

HIGHEST TRANSMISSION VOLTAGE IN THE WORLD.

Transformers for a 150,000 volt transmission line are now under construction by the Allis-Chalmers Co., Milwaukee, Wis. They are 4,000 kv.a. single phase, 60 cycle, oil filled and water cooled, for service on the Pacific coast on the lines of the Nevada-California Power Co. These transformers are designed for 36,000 and 6,600 volts on the low side, and 87,000 volts on the high voltage side. Three form a group which will be connected in "delta" on the low voltage side. The high voltage side is connected in "Y" to give 150,000 line voltage. The transformers are designed for an insulation test, between high voltage and low voltage coils, or between high voltage coils and iron, or 300,000 volts, alternating current, for one minute. The principal dimensions are as follows :— diameter of base 8 ft. 10 in.; height to top of cover 15 ft. 8 in.; height to top of high tension terminals 19 ft. 10 in. With normal supply of cooling water these transformers will carry full rated load for 24 hours with a temperature rise not exceeding 40 degs. C. They will carry 25 per cent. overload continuously with a temperature rise not exceeding 55 degs. C. Each transformer complete with oil, will weigh about 43 tons, and the efficiency at full load will, it is claimed, be considerably over 98 per cent.

NEW AND OLD LOCOMOTIVES.

The Pacific type locomotive, which the Pennsylvania Railroad has adopted for heavy passenger service, is the largest and most powerful passenger locomotive in use on that road. The locomotive and tender of this Pacific, or K-2 type, when loaded with coal and water, weigh about 430,000 pounds. There are six driving wheels 80 inches diameter, and the boiler contains 359 tubes, each 20.9 feet long by 2¼ inches diameter, making a total of nearly 1½ miles of tubes. The heating surface of the tubes is about 4,420 square feet, and, in addition, the fire-box has a heating surface of 199.3 square feet, the steam pressure is 205 pounds.

The oldest American locomotive, the "John Bull," put into service on the Camden and Amboy Railroad in 1831, now in the National Museum, at Washington, weighs 24,625 pounds. It has 54-inch driving wheels, and 7 foot 6 in. tubes, giving a heating surface of 213 square feet.

PROFIT SHARING AT A PAPER MILL.

The following intimation, affecting about 700 employees, has been posted in the various departments of the Inveresk Paper Mills, Musselburgh, Scotland :— "As recognition of the exertions of their employes during the past year, the directors have decided to give a bonus at the rate of one week's pay, which will be paid during the first week of December. With the view to continuing this system in the future, the directors venture to ask for the hearty co-operation of all their employes, who can by carefulness and diligence, render it possible and perhaps extend it." The managing director of the company, R. C. Menzies, J.P., St. Michael's, Inveresk, and the other proprietors, have shown a keen interest in the welfare of the workpeople by surporting their bowling green, their reading and recreation rooms, and in other ways.

THE GEORGIAN BAY CANAL.

A recent visitor to Ottawa was Sir Robert Perks, of the contracting firm of MacArthur, Perks & Co. In the course of an interview, Sir Roberts Perks stated that he entertained hopes for the early construction of the Georgian Bay canal. The repudiation of reciprocity would expedite the carrying out of the project. The Panama canal, he said, would be completed in 1913, and the United States would make a desperate effort to divert Canadian trade to Canada's western ports, to the detriment of the East. With the completion of the Georgian Bay canal, Ottawa would become a port in much the same way as Manchester became a port through the building of the Manchester ship canal. The construction of a canal from the St. Lawrence to Ottawa would take five years.

ST. LAWRENCE RIVER COMMISSION.

The commission which will deal with navigable conditions on the St. Lawrence River is composed of :—Professor C. H. McLeod, McGill University; W. I. Gear and Arthur Surveyor, Montreal. The appointment was made by an order-in-council dated August 29th, and will be known as the St. Lawrence River Commission. The duties of the new organization will be to examine conditions prevailing in the river and to report upon the many power schemes now before the federal authorities and the effect of such works upon the navigation of the river. Its jurisdiction will extend from the head of Lake St. Francis to the port of Montreal. The commission will also study the improvement of the river channel and the feasibility of deepening the water highway to the sea to a depth of 22 or 25 feet

"Work of the right kind strengthens the body, and develops the mind and the character. Remember what you do today helps on what you do to-morrow. Your daily efforts are linked together and cannot be considered alone."

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

FOUNDRY AND MACHINE SHOP.

Toronto, Ont.—The Semet-Solway Co., of Syracuse, N.Y., propose establishing a big coke manufacturing plant here. The proposed plant will cost about $2,500,000. Coal by-products will also be manufactured.

Saskatoon, Sask.—The W. H. Church Co. will establish a plant here to manufacture a patented cement land packer. They will also carry on a general machine and foundry business.

Sarnia, Ont.—The Robeson Preserve Products Co. have decided to locate at Point Edward, where they will engage in the manufacture of a preservative of wood, canvas, iron, steel, concrete, etc.

Hamilton, Ont.—It has been announced that next year the Steel Company of Canada will spend $2,000,000 enlarging its plant. The plans include a rod, blooming and billet mills, and two sixty-ton continuous open-hearth furnaces.

Sarnia, Ont.—The Mueller Manufacturing Co. contemplate establishing a brass factory here. The town is being asked to grant a bonus of $20,000.

Calgary, Alta.—Hon. W. H. Cushing may engage in the manufacture of street cars here.

Wingham, Ont.—The ratepayers passed the by-law to grant a loan to the Western Foundry Co. to construct a new building and instal a new plant.

Port Colborne, Ont.—A smelting works is ready to locate here providing a lease of dockage can be secured.

Vancouver, B.C.—The Granby Consolidated Mining & Smelting Co. intend erecting a reduction works at Goose Bay, Observatory Inlet, Portland Canal District. $1,000,000 will be expended.

Hedley, B.C.—The machine shops of the mining plant of the Hedley Gold Mining Co. have been improved by the addition of an arrangement for grinding worn-out locomotive drive wheels and car trucks. Another addition recently made was the installation of a powerful magnet to separate the mine steel from the ore.

Welland, Ont.—It is expected that the John Deere Manufacturing Co. will shortly commence the erection of their $1,000,000 plant here.

Oakville, Ont.—The Ware Mfg. Co. are building a factory here, 61x180 ft. and one-storey high.

Moncton, N.B.—A recent announcement from semi-official sources, says that a portion of the I.C.R. workshops here will be transferred to Riviere du Loup, Que.

Pembroke, Ont.—Fire did $50,000 damage to the works of the Thomas Pink Co. recently. The machine shop and a quantity of valuable tools and patterns were completely destroyed.

St. Johns, Que.—The ratepayers have voted to bonus the Lightning Furnace Co., of Montreal, and the latter are now preparing to establish themselves here.

Kingston, Ont.—Geo. Wright's machine shop was entered recenty by burglars who made away with tools to the value of $35.

Ladysmith, B.C.—The Tyee Copper Co. will instal converters in their smelting plant here and otherwise improve their property.

Wingham, Ont.—A farm implement manufacturing firm has been in touch with the authorities and will likely establish an industry here.

Galt, Ont.—The Katie Foundry Co. are among the first to take advantage of the industrial sites in Galt, They will establish an up-to-date plant here, work on which will be started next spring.

Regina, Sask.—Fire wiped out the plant of the American Abell Thresher and Engine Co. here recently. The estimated damage is distributed as follows: buildings, $10,000; separators and engines, $60,000; and repairs, $100,000.

North Battleford, Sask.—A newly incorporated company, Wm. Clark & Co., have secured a site and will erect a foundry and shops 40 x 80 feet.

Galt, Ont.—Work on the Canadian Motors, Limited new building is considerably advanced. Other buildings will be erected in the spring.

Welland, Ont.—The new buildings for the Page-Hersey Co. have been completed and manufacturing will be started just as soon as the new machinery is installed.

Guelph, Ont.—The Stewart Sheaf Loader Co., of Winnipeg, will establish a $100,000 factory here, and give employment to 400 men. It is expected that the new factory will be completed by the first of November, 1912.

Fort William, Ont.—Frank V. Samwell, of Guelph, will establish a foundry here for the manufacture of wrought iron pipes. The plant and equipment will cost about $200,000, of which the city is being asked to loan $100,000. 500 men will be employed.

Trenton, Ont.—The new C.N.R. shops are practically completed. The works include fifteen stalls, boiler shop and machine shops, and occupies five acres of land.

Lindsay, Ont.—Several improvements are being made to Horn Bros.' woollen mills. The boiler shop has been enlarged by the addition of a brick building 48x118. A 150 h.p. boiler and a 100 h.p. Corliss engine are also being installed.

Point Levis, Que.—The G.T.R. round house was wiped out by fire recently.

Quebec, Que.—The C.N.R. have agreed with the city to immediately commence the erection of their workshops here. In addition to the car shops, a round house and storehouse will be built.

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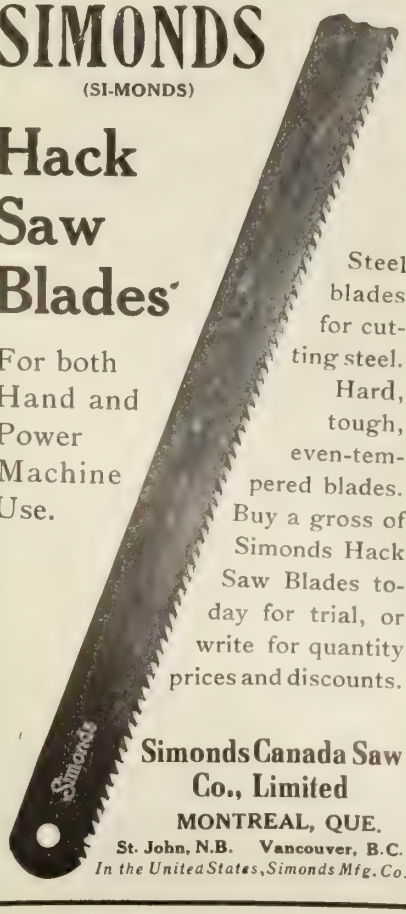
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Milton, Ont.—The Imperial Foundry Co. shipped its first hot water boiler recently, the same going to a Toronto tenement house.

Regina, Sask.—The sum of $4,418 will be applied to the purchase of equipment for the municipal railway's machine and blacksmith shop, armature shop, pit and motors.

Porcupine, Ont.—A second-hand stamp mill has been acquired by the Little Pet Mine from the Swastika Mining Co. A new stamp outfit will likely be put in.

Windsor, Ont.—The ratepayers cast their votes in favor of the by-laws granting inducements to the Hupp Motor Co. and the White Machine Works. The latter concern are erecting a steel plant 100 x 36 ft., while the former have prepared plans for two buildings 176x 128 ft. and 175 x 36 ft.

Saskatoon, Sask.—Messrs. Straphy & Spencer, of Medicine Hat, have been here with a view to locating an industry for the manufacture of a patent pump which they are introducing.

MUNICIPAL.

Saskatoon, Sask.—The municipality is planning to spend $72,000 for storm sewers.

Point Claire, Que.—The municipality is taking steps to install drains, waterworks and electric light.

Blairmore, Alta.—The ratepayers will be asked to vote $45,000 for a waterworks system.

Medicine Hat, Alta.—The municipality is planning to spend $45,000 extending the waterworks.

St. Catharines, Ont.—The ratepayers will vote on a by-law to offer $38,000 to the St. Catharines Artificial Gas Co. for their works, plant and business.

Vancouver, B.C.—The city engineer has estimated that $7,000,000 will be required to finish the city's work, which includes sewers, street improvements and board of works plant.

Penetanguishene, Ont.—The ratepayers will be asked to pass a by-law to place the waterworks and electric light under the management of a commission.

Moose Jaw, Sask.—The ratepayers passed three debenture by-laws totaling $603,000 for waterworks, fire apparatus and sidewalks.

Brandon, Man.—The ratepayers have decided to grant the street railway franchise to a private company, instead of inaugurating civic ownership.

Montreal, Que.—The city is planning to spend $500,000 to continue the water filtration scheme.

Medicine Hat, Alta.—The ratepayers will vote on a by-law to provide $45,000 for water main extensions.

Three Rivers, Que.—The ratepayers gave their assent to a by-law providing for an electric street car system.

Ingersoll, Ont.—The burgesses passed the by-law providing $7,500 for industrial purposes.

Neepawa, Man.—The by-law to raise $100,000 for a waterworks system was carried.

ELECTRICAL.

Berlin, Ont.—The by-law to provide $25,000 for lighting purposes was carried by the ratepayers.

Swift Current, Sask.—The by-law providing for an electric light system was passed by the ratepayers.

Baden, Ont.—The ratepayers have authorized an expenditure of $5,000 for the erection of a power plant.

Beachville, Ont.—The by-law to raise $5,000 for a Hydro-Electric power plant was carried by the burgesses.

Rouleau, Sask.—The ratepayers passed the by-law to raise $15,000 for the completion of the electric light system.

Sturgeon Falls, Ont.—The town will purchase the Sturgeon Falls Electric Light & Power Co. for the sum of $25,000.

Waterford, Ont.—The by-law providing for an electric power service was passed by the ratepayers.

Killarney, Man.—An offer subject to the approval of the ratepayers has been made for the purchase of the Collison Electric Light Co. for $13,000.

Upton, Que.—The municipality is planning to instal a waterworks and electric light plant.

Brantford, Ont.—Several conferences were held here recently with regard to Hydro-Electric power, and by-laws providing for same will likely be submitted here and in Paris, in the near future.

Toronto, Ont.—The proposed Hydro-Electric extension by-law will entail an expenditure of approximately $2,220,000.

Lethbridge, Alta.—The report of the superintendent of engineers to the city council in brief, is as follows: In the power house they have generated 138,055 kilowatt hours in July, 109,185 kilowatt hours in August, and 128,080

kilowatt hours in September, making a total of 375,420 kilowatt hours for the quarter. Water pumped was as follows; July, 34,204,000 gallons; August, 27,911,000 gallons; September, 280,233,000 gallons, making a total of 90,138,000 gallons for the quarter. The finances are as follows:

	Receipts.	Expenditures
July	$6,111.12	$4,009.07
August	7,436.52	4,034.78
September	7,489.82	4,433.06
	$21,037.46	$12,476.91

This shows a profit of $8,560.55 for the quarter. Deducting $6,109.92 quarterly interest and sinking fund, there is left a net gain of $2,450.63. Adding that of the previous six months, $8,414.77, there appears a total profit of $10,865.40 for the nine months.

Quebec, P.Q.—It is reported that the Quebec Government is likely to follow the Ontario Government and appoint a commission with similar powers to the Hydro-Electric Commission, in the near future. It is also stated that the head of the new commission will be Hon. S. N. Parent, late chairman of the Transcontinental Railway Commission.

Halifax, N.S.—Report states that the Dartmouth Electric Light Co. will pass into the possession, about the new year, of F. B. McCurdy & Co., for parties who did not appear in the transaction. It is further reported that the property is being purchased for the Nova Scotia Power Co., whose plant will be on the Mersey River, eighty miles from Halifax. The present owners of the Dartmouth plant are the Royal Securities Co.

Niagara Falls, Ont.—The Court of Revision has refused to entertain the appeal of the Ontario Power Co. for a reduction of assessment from $1,941,000.

Ottawa, Ont.—An order-in-council has been passed formally approving the plans of the Cedar Rapids Power Co., for the development of power at Cedar Rapids in the St. Lawrence River.

Ottawa, Ont.—It is the intention of the Ottawa Electric to largely add to their steam auxiliaries in the near future as well as to proceed with further larger waterpower development to the extent of ten thousand horsepower at the Chaudiere. The company owns the waterpower in the middle of the Deschenes Rapids between the Hull Electric and Metropolitan powers, with a view to future development. The business is increasing and the contemplated improvements are to keep pace with it.

St. John, N.B.—Cheaper power for new industries in St. John will be secured if the provincial legislature ratifies the agreement made between the city council and the New Brunswick Hydro-Electric Co. The latter has been given a fifty years' franchise, subject to various provisions, and the maximum rates for power and light are stated as part of the agreement. The company proposes to generate power at Lepreaux and transmit it to the city. Its franchise is not exclusive and will not prevent the Inglewood Pulp and Paper Co., which has valuable waterpower nearer to the city, from doing business on similar terms. The latter company has also opened negotiations with the city. The outlook, therefore, is for cheap light and power.

Winnipeg, Man.—The civic power commission of Winnipeg, has closed a long term contract with the Canadian Pacific Railway for the supply of 500 horsepower from the Point du Bois plant.

Byron, Ont.—The residents have asked for hydro power, and Superintendent Glaubitz, London, has promised to take up the extension of the line for them at once.

Virden, Man.—The mayor and council are open to receive proposition for installation and operation of light and power plant within the town limits. Information from Secy.-Treas. J. F. G. Menlove.

Waterford, Ont.—The by-law to install an electric lighting system carried by a vote of 176 to 46, and tenders will be called at once.

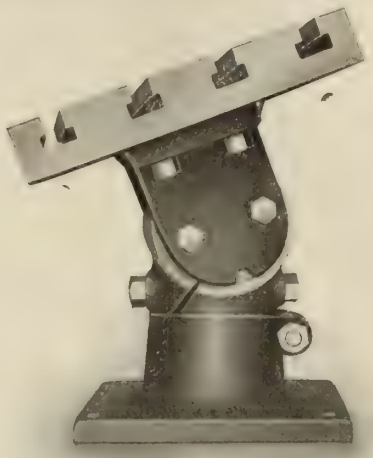
Saskatoon, Sask.—The new power house being erected at Saskatoon is well under way. The steel work and most of the brick work is completed. The floor space covers an area of 85x54 feet. Three 500 h.p. boilers are being installed this autumn, which will operate three generators not yet set in place. The boilers are of the Babcock & Wilcox type. It is expected that a large hydro-electric plant will be started next spring, a few miles out of Saskatoon, by a private company. It is also expected that the same company will construct and operate a street railway system. The present intention is to obtain power for the city's requirements from the hydro-electric installation when complete. To this end the power house is being made large enough to accommodate transforming equipment.

Windsor Mills, P.Q.—The Corporation of Windsor Mills, P.Q., has accepted the tender of the Canadian Crocker-Wheeler Company, of St. Catharines, Ont., for three-phase sixty-cycle apparatus, to replace the present equipment of 125-cycle single-phase.

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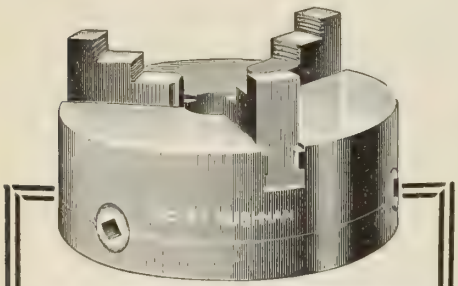
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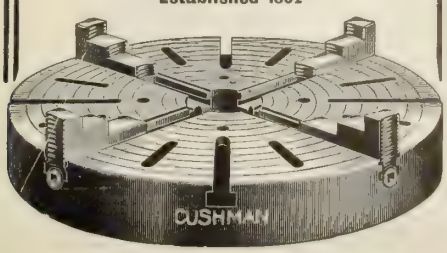
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BUILDING NOTES.

Montreal, Que.—A new apartment house is to be erected on Bishop Street. It will cost $100,000.

Medicine Hat, Alta.—Messrs. H. E. Lotz and K. J. McRae are planning to build a new opera house here.

Toronto, Ont.—The Masons of Toronto are preparing to erect a $250,000 hall here.

Vancouver, B.C.—Representatives of the Sullivan and Considine circuit have been here in connection with the proposed new theatre.

Calgary, Alta.—The city engineer has prepared plans for a new traffic and street railway bridge, to cost $100,000.

Brandon, Man.—The Manitoba Winter Fair board have prepared plans for a building to cost $80,000.

Toronto, Ont.—Entirely new plans have been prepared for the new Central Y.M.C.A. The new plans call for a building to cost $500,000.

SAW AND PLANING MILLS.

Calgary, Alta.—The Wattsburg Lumber Co., of Wattsburg, B.C., contemplate establishing a sash and door factory here.

Calgary, Alta.—The Riverside Lumber Co. intends erecting a box factory here in addition to their already large plant.

Quesnel, B.C.—The Reid sawmill was totally destroyed by fire recently, the loss being in the neighborhood of $15,000.

Emo, Ont.—W. J. Thompson, of Kenora, has reconstructed and improved the old Matchet sawmill here.

Edmonton, Alta.—The Edmonton Casket & Box Mfg. Co. intend erecting a new and greatly enlarged plant.

Beamsville, Ont.—The planing and flour mills of R. O. Konkle were destroyed by fire recently. The loss is $9,000.

Prince Rupert, B.C.—Anthony Ludgate, of Pembroke, Ont., proposes building a lumber mill and will probably locate it near Kitsumkalum.

Fruitvale, B.C.—Darseveld Bros. are preparing to erect a sawmill here.

Dryden, Ont.—The Dryden Timber & Power Co. have commenced the erection of their pulp and paper mill. It is expected that it will be completed by next July.

Mull, Ont.—The lumber and stave mill of Neil Watson was destroyed by fire recently. The damage amounted to $8,000.

Kamloops, B.C.—The Kamloops Sash and Door Factory will be greatly enlarged. The new premises will be equipped with modern machinery.

GENERAL MANUFACTURING

Toronto, Ont.—Plans are being prepared for erection of a tanning factory to cost $13,000 for W. B. Levack, 1189 Bathurst Street, Toronto; 2 storeys, brick and concrete, concrete foundation, tar and gravel roof, steam heating, electric lighting, fire escapes, tanning machinery, brick, concrete vats, etc.; sprinkler system, pumps, engines, boilers, and beam house equipment.

Hamilton, Ont.—Tenders will be called shortly for extension to plant to cost $2,000,000, on Sherman Avenue, of Steel Company of Canada. Morgan & Co., Worcester, Mass., U. S., are preparing plans. Rod mill, blooming mill, billet mill, two 60-ton continuous open-hearth furnaces are required.

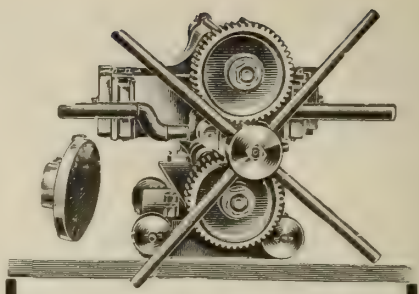
Edmonton, Alta.—Tenders are called until Jan. 1 for machinery for Edmonton Portland Cement Co., Hoser, Ryder block, Edmonton; coal crushers and pulverizers; also clinker crushers.

Aylmer, Ont.—The Aylmer Pump & Scale Works will enlarge its offices and make extensive improvements in them. Modern equipment will be required.

Brantford, Ont.—The Cockshutt Plow Co. is said to have acquired a controlling interest in the Brantford Carriage Works and the Adams Wagon Works Co. Both plants will extend.

Brantford, Ont.—It is expected that the Barber-Ellis Co. will build a factory on Marlboro Street, to employ 250 hands.

Calgary, Alta.—W. H. Cushing, sash and door manufacturer, Calgary, is contemplating the erection of a plant for the manufacture of street car bodies. The Western Machine & Supply Co. have made application to the city for a site in the Manchester subdivision for erection of a factory. The company wishes to engage in the manufacture of iron products. Industrial Commissioner Mr. Miller, Craig and Rose, Edinburgh, Scotland, are contemplating the erection in the city of a plant to manufacture paints and varnishes. Fraser & Seablow are excavating for business block, cost $30,000, in East Calgary; architect, L. Dowler. Alexander block, Calgary; four-storey, 33x80, brick, concrete foundation, steam heating (steam boiler), electric light, tar and gravel roof, hardwood interior finish. Remainder of work in spring. No general contract let. It is probable owner will supervise.



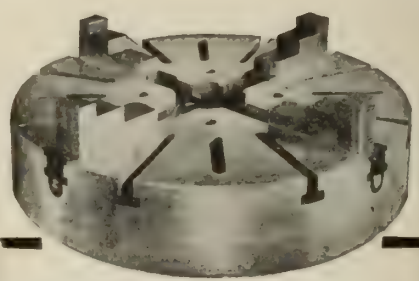
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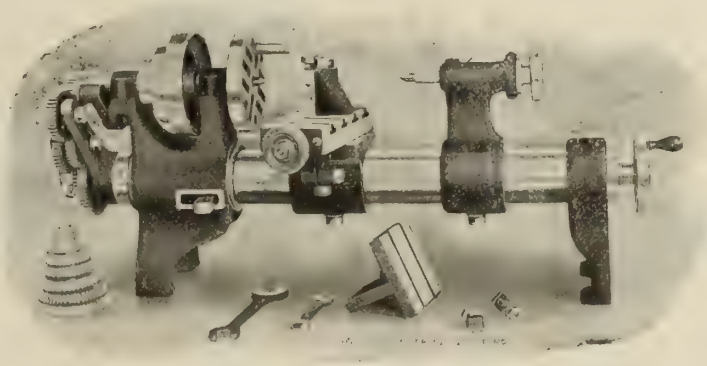
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GENERAL BUILDING.

Port Arthur, Ont.—The Pella Stocker Co., of Pella, Ia., will locate the Canadian branch of their industry here. The buildings and site will cost $45,000.

Kingston, Ont.—The G. T. R. have applied for 750 h.p. to run a drilling and crushing plant at a granite quarry to be located a few miles from here.

Portage la Prairie, Man.—The new addition to the Stephens Brick Co. was completed recently. It is operated by a 50 h.p. steam plant.

Chatham, N.B.—Groat's carriage and repair shops suffered $4,000 loss by fire recently.

Woodstock, Ont.—The City Dairy Co., of Toronto, are erecting a $12,000 building here and will make Woodstock their distributing point. They will also manufacture butter and condensed milk.

Brantford, Ont.—The carriage shop of Reeve Cameron was destroyed by fire recently. The loss is $1,500.

Port Cilborne, Ont.—The Crown Gypsum Co., Lythmore, in Oneida Township, have let the contract for a new factory, 244x70 feet. Modern machinery will be installed.

Calgary, Alta.—Mayor H. A. Shortt and Conrad Knapp, of the Michigan "Soo," contemplate spending $100,000 in the erection of a brewery here.

Toronto, Ont.—Scythes & Co. have purchased the two-storey factory at 243 Macdonell Ave. for $13,000. The property is 50x225 feet.

Ottawa, Ont.—The Wm. Davies Co., of Toronto, will erect a large warehouse here. This will include a cold storage plant.

Toronto, Ont.—The Cooper Cap Co. are erecting a $60,000 warehouse at the corner of Grange and Spadina.

Sydney, C.B.—Nash & McAllister are erecting a bottling plant in connection with their soda water factory here.

Toronto, Ont.—The Copland Brewing Co. are building a $50,000 addition to their brewery here.

Wallaceburg, Ont.—The Dominion Sugar Co. have placed an order for two new 700 and 800 h.p. gas engines, which will be about the biggest in Canada.

Bracebridge, Ont.—The Shier Lumber Co. contemplate building a chemical plant here.

Massett, B.C.—It has been reported that an English company has purchased the oil plant at Skidmore and will expend $50,000 on a cold storage plant.

St. John, N.B.—T. S. Simms & Co. have secured a site for their new brush factory here.

Hamilton, Ont.—The Dominion Canners have set aside $500,000 for extending their plants at various centres. $100,000 will be spent on a factory here.

TRADE NOTES.

The Canadian Tap & Die Co., Galt, Ont., are soon to add to their now extensive line of Little Giant screw plates by placing on the market a new set, which, while maintaining their high degree of accuracy, will be sold at a price that will bring it within the reach of everyone. Its capacity will be ¼ to ½-in. by 1-16th.

The Russell Machine Co., St. Catharines, took a contract recently to cut a 40-inch gear, and successfully completed the work on a McGregor-Gourlay shaper. This is something new in the cutting of gears. Special jigs were made for the purpose. Some large concerns in the machine repair business turned this work away. Great credit is due this young, enterprising firm. They recently made alterations at their factory and equipped themselves for all kinds of drop forging and press work, having installed the latest machinery necessary for this purpose.

The St. Catharines Brass Works is a rapidly growing concern, having recently made an addition to their plant.

"Dominion" Grinding Wheels
are graded to suit your particular requirements. We will be glad to help you out on any proposition. *For sale by*
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THE DOMINION ABRASIVE WHEEL & SUPPLY CO., Ltd. BIRMINGHAM, ENGLAND
Or the Manufacturers
The Dominion Abrasive Wheel Co., Limited
NEW TORONTO, ONT., CANADA

The Kerr Turbine Co., Wellsville, N.Y., advises that over 700 of their machines, aggregating more than 50,000 h.p., are in active service, and that more unfilled orders are now booked than at any previous time in the history of the company. Although their plant has been materially enlarged, a night shift has been necessary for the past two and a half years. Among recent orders are the following: One 350 kw. turbo-alternator for the Brooklyn refinery of the Standard Oil Co.; two 2800-gal. per min. turbo-pump units for Tidewater Oil Co.; two 75 kw. and one 35 kw. lighting sets to American Shipbuilding Co., for the new steamer "City of Detroit"; two 75 kw. lighting sets for waterworks service, City of Chicago; one 60 b.h.p. turbo-generator, with prony brake attachment, for the University of Melbourne, Australia (this unit takes steam at 200 lb. gauge, with 200 deg. superheat, and exhausts to 28-in. vacuum); one 215 h.p. turbo-blower for Peoples Gas Light & Coke Co., Chicago (the tenth set of this size ordered by these people); two underwriter fire pumps driven by 200 h.p. Kerr turbines, for Stieger & Sons' piano factory, Stieger, Ill.; one fire pump driven by 265 h.p. Kerr turbine for B. M. Osbun Co., Chicago. This last named will be the only turbine-driven fire pump in the City of Chicago.

Steel & Radiation, which was recently constituted from several local ironworking concerns, will have Sir Henry M. Pellatt as president, and Hon. J. M. Gibson as vice-president.

Montreal.—The board of control have ordered plans prepared for a refrigeration plant for Bonsecours market. No estimate has yet been mentioned.

The Robb Engineering Co., Amherst, N.S., have secured the following contracts: The Wellesley hospital, Toronto, two Robb-Armstrong engines, direct-connected to Westinghouse generators, for their new power plant; the Imperial Oil Company, of Winnipeg, a Robb-Armstrong engine of 150 h.p. direct-connected to a Westinghouse generator; the Edison Electric Co., Springhill, N.S., a 200 h.p. Robb-Armstrong Corliss engine, direct-connected to electric generator.

The Berg Machinery Co., Bathurst Street, Toronto, are replacing their steam plant with electric drive. The new equipment will consist of twelve motors, totaling 127 h.p.

The Spectator Printing Co., Hamilton, are installing individual motors on all their presses and machinery. The presses are to be driven by variable speed d.c. motors and current for same will be supplied by a d.c. generator, driven by an a.c. motor.

The University of Toronto are installing a 440 h.p. high-speed, compound engine, driving a 300 kw. d.c., 3-wire generator.

Contracts for all the above equipments have been awarded to Chapman & Walker, contracting engineers, 69 Victoria St., Toronto.

The John Inglis Co., Toronto, have recently completed a horizontal cross-compound, double-acting, outside packed pump for the town of Gananoque, Ont. It is of the "tug-of-war" type, and has steam cylinders 13 and 24 inches diameter by 24 inches stroke. The water plungers are 8⅞ inches diameter. The pump runs at 50 r.p.m., and has a capacity of 1½ million gallons per 24 hours, against a domestic pressure of 60 pounds and a fire pressure of 115 pounds. It is arranged with piping and valves so that either side can be run independently of the other.

Jones & Glassco, Nicholas Building, Montreal, advise us that their principals, Hans Renold, Ltd., Manchester, England, manufacturers of Steel Driving Chains, have been awarded the Grand Prix at Turin, Italy, in four classes—these being for their Chains for Engineering, Cycle, Motor-cycle, and Motor Vehicle work.

The main offices of **A. Eugene Michel and Staff, Advertising Engineers,** have been moved into the Park Row Building, 21 Park Row, New York, where larger space has been secured, as necessitated by constantly increasing business.

Jones & Glassco, Nicholas Building, Montreal, inform us that their principals, Watson, Laidlaw & Co., Glasgow, have been awarded one Grand Prize, one Diploma of Honor and two Gold Medals for their Centrifugal, Hydro-Extractors and Cream Separators, at the Turin Exhibition, Italy. The installation which received the Grand Prize was the one in which an electrically-driven, a water-driven and a belt-driven machine were erected on the same framing for comparison of the three systems. The Diploma of Honor was awarded to the Hydro-Extractor method of driving Centrifugals. The Gold Medal was awarded to the Hydro-Extractor exhibited, and the Princess Cream Separator secured the other Gold Medal.

The Cambria Steel Co. has appointed W. Beverly Robinson & Co., Montreal, as its Canadian agents for the sale of rails, billets, cars, wire products, etc.

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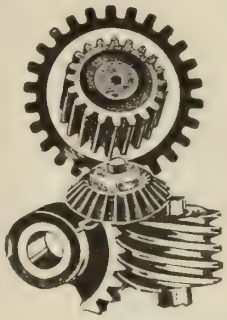
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All weights up to 6.000 lbs.
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WATER POWER AND SUPPLY.

Quebec, Que.—Tenders are called until Dec. 20th for new water supply scheme. Consulting engineer, T. A. Jardine Forester, Quebec (A)—44 and 40-in. dia. c.i pipes, specials, valves, etc. (B)—44 and 40-in. dia. steel pipes, specials, etc. Specifications at city hall.

Strathcona, Alta.—Specifications are being prepared for extension of pumping plant. City engineer, A. J. MacLean; superintendent, power plant, Engineer J. Watson. Another unit is contemplated; pump to be for high pressure work and of turbine type either engine or motor driven. Cost estimated at $20,000. Specifications being prepared by Mr. Watson.

Vancouver, B.C.—Water power plant to cost $500,000, Puntledge river, for the Canadian Collieries, of Dunsmuir; contractors, Grant, Smith & Co., Pacific Bldg., Vancouver. Plant will develop 12,000 h.p. hydraulically; power for mines and railway will be furnished. The company will expend $1,600,000 in new equipment and extensions next year in the coal fields on Vancouver Island.

Walter B. Snow announces the recent addition to his staff of Sidney G. Koon, M.M.E., for four years editor of "International Marine Engineering," and later metallurgist, Jones & Laughlin Steel Co.; and also the addition some time since of John S. Nicholl, B.S., lately with the New York Edison Co., and formerly acting manager for F. W. Horne, importer American machinery, Yokohama, Japan. Both are members of the American Society of Mechanical Engineers.

CATALOGUES.

The Positive Clutch and Pulley Works, Ltd., Toronto, have just issued a new catalogue the second in twelve months. This is significant of the rapidly increasing range of their products and the large demand for same. The firm's positive combined jaw and friction clutch is fully described and illustrated, as well as their splitwood rim pulleys with steel centres. A full line of transmission appliances is also manufactured. The catalogue contains numerous useful engineering tables, and should be on the fyle or every superintendent and millright.

Veritys, Ltd., Aston, Birmingham, England, have sent us a circular descriptive of their Radiant Lanterns for tungsten and carbon lamps which are suitable for indoor or outdoor use. Prices are quoted in Canadian currency.

The American Steam Pump Co., Battle Creek, Mich., who manufacture the Marsh and American lines of pumping machinery, have just issued a 188-page catalogue which they will be glad to send to anyone interested in pumping machinery.

The United Engineering and Foundry Co., Pittsburg, Pa., have sent us a copy of their catalogue of High Speed Forging Presses, built under Davy Brothers, Ltd., patents. These presses are of the steam-hydraulic intensifier type, and are built in sizes ranging from 100 to 12,000 tons. A special feature is the patented automatic single lever controlling gear by which all movements are governed. The catalogue is attractively got up, and illustrates numerous press equipments.

The Garvin Machine Co., New York, have forwarded several circulars descriptive of their No. 2 Screw Slotting machine, No. 13 and 13½ plain milling machine, No. 22 Vertical milling machine, and cutter and surface grinders. The contents will be found interesting and valuable to those in the market for such products.

"The Economy Elevator Guide Lubricator, The Lubricator that Lubricates," is the title of an attractive catalog just issued by the Peterson Engineering Co., Lubrication Engineers, Hudson-Terminal Building, New York City. The catalog describes a new method of lubricating elevator guides in which a thin strip of grease is applied exactly where the shoes bear on the rails and for every trip of the car. Several different types are described suitable for steel and wooden rails and also for counter weight guides. Interesting data are given of tests made on elevators equipped with the Economy Lubricator. For instance, it is stated that in the 168th Street Station of the New York Subway, the Economy Lubricator reduced the grease consumption from 480 ounces to 30 ounces per month. An analysis of the cost of lubricating the elevators in the Washington Monument, by means of the Economy Lubricator is also included. Copies of this catalogue may be had by addressing the manufacturer at the above address.

Hawksley, Wild & Co., Sheffield, England, have sent us a 4-page leaflet containing an illustrated description of the "Brightside" water-tube boiler manufactured by them. The cuts represent 4 and 6-drum types for hand-firing, as also an adaptation of superheater and chain grate stoker. The tubes are straight and almost vertical, and are arranged without headers and caps. The arrange-

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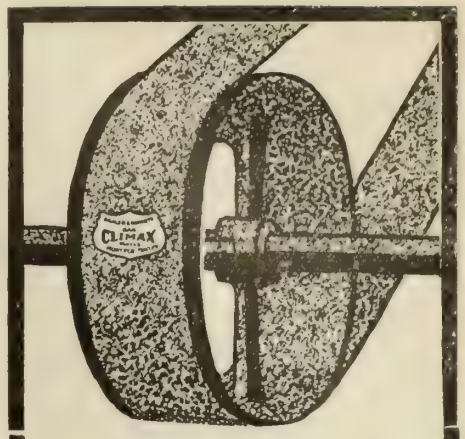
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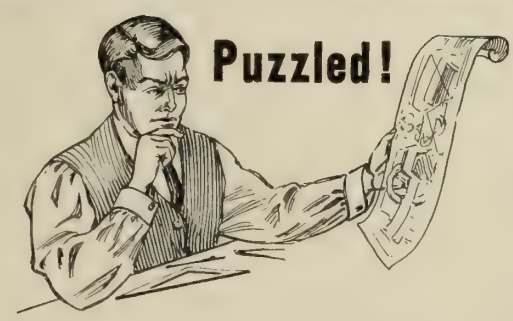
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ment generally is compact and provides for high efficiency and ease of overhaul and inspection.

BOOK REVIEWS.

Maximum Production in Machine Shop and Foundry, by C. E. Knoeppel. New York: The Engineering Magazine. This book deals exhaustively with the organization and methods to be followed by a manufacturing concern in order to obtain the highest efficiency in machine shop and foundry, and carries strong internal evidence of the author's intimate acquaintance with the problems that arise in daily practice. We can confidently recommend it to the notice of Business Managers, Works Managers, Chief Accountants and others whose business it is to increase production. Mr. Knoeppel claims that we need to hear more about inefficiency and less about efficiency; and that if we talk about the inefficiencies more, our effects towards eliminating them will be increased, and efficiency, as a natural result will take care of itself. He, by no means, confines himself to broad general theories. On the contrary, having laid down a principle of management, he frequently goes on to give concrete examples of its application, which, are needless to say, both interesting and instructive. Most of the material in the book appeared originally in three series of articles published in the Engineering Magazine. It has, however, been resurveyed, rearranged and largely re-written, and forms a valuable contribution to the subject of scientific management.

"Wood-Turning," by Geo. H. Resides and Hugo Diener. New York: McGraw Hill Book Co. Price $1.50. This publication should be welcomed by students in technical high schools, pattern-maker apprentices, and others interested in wood-working. The book opens with a description of the wood-turning lathe and its equipment, and later, practical exercises are given the student, consisting of chisel handles, vases, urns, etc. Each article is shown fully dimensioned on one page, while on the opposite page are given the instructions to be followed, accompanied by numerous excellent half-tone illustrations. The second half of the book deals with pattern-making in a manner well suited to the needs of apprentices and those wishing to acquire an insight into that trade.

Bearings and their lubrication, by L. P. Alford, M.E., New York, and the McGraw-Hill Book Co., $2.50 net. This book aims to present the underlying principles involved in the design of all classes of machinery bearings. A wide field is covered and numerous examples given together with tables compiled from various sources, both American and European. The laws of friction are so imperfectly understood that a book like the present, which tabulates the results of numerous careful experiments, will be of great use to all designers of machinery and transmission appliances.

The "Mechanical World" Pocket Diary and Year Book for 1912. Emmott & Co., 65 King St., Manchester, England. Price 12 cents. The present number, making the twenty-fifth issue of this little Diary and Year Book, is well up to its usual high standard. Among other new features introduced for the first time are to be found sections dealing with indexing on the milling machine, gauging cylindrical bores, verniers and micrometers, roller bearings, etc. Draftsmen will find the subject of beams and girders clearly dealt with, and several extremely useful tables, giving values of I and Z for various sections, will be welcomed as time-savers, where calculations are concerned.

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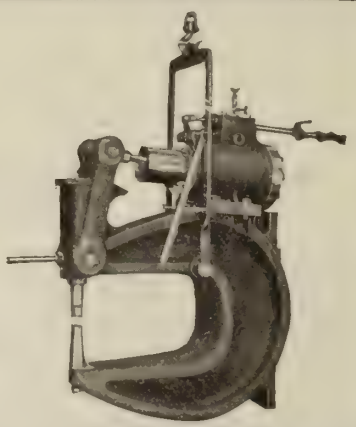
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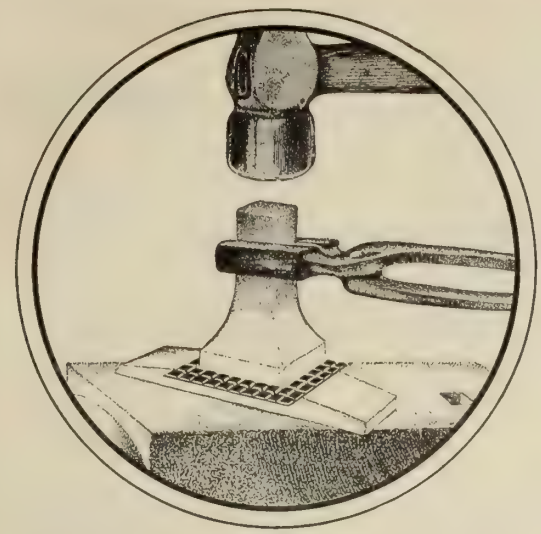
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Special riveters designed to meet all requirements.
"WHATEVER THE RIVETING, THERE'S AN ALLEN FOR THE JOB."

JOHN F. ALLEN COMPANY
Est. 1872
370-372 Gerard Avenue, NEW YORK
AGENTS—Canadian Rand Drill Co., Toronto, Halifax, Montreal. Liebers and W.U. Codes, "Riveter."



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The larger you are the more you need

Laffitte Welding Plates

Our product is to-day an economical necessity in every well-regulated shop, and used in every part of the civilized world.

Let us send you samples and have them tried out. There are endless economies you can effect, the cost is insignificant compared with the results.

For sale by all active dealers throughout Canada.

THE PHILLIPS-LAFFITTE COMPANY

801 Penna. Bldg., Philadelphia, Pa., U.S.A.

OXYGEN

Of guaranteed purity by the Claude's Process. The largest and most up-to-date plant now in operation on this continent.

OXYACETYLENE

AND ALL SYSTEMS OF

WELDING and CUTTING PLANTS

For welding steel, cast iron, copper, brass, lead, aluminum. For cutting steel and wrought iron.

SAMPLE AND REPAIR WORK UNDERTAKEN

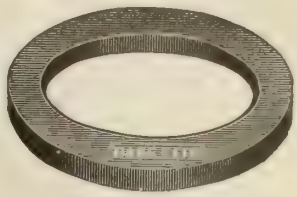
R. J. LEVY

MANUFACTURER OF OXYGEN

MAISONNEUVE - MONTREAL

Telephone East 6713

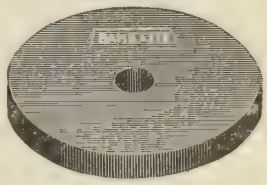
These are the telling points about



Bakelite

Valve Discs

THEY will not leak under high temperature, excessive pressure or when used in acids or other special liquids. Neither cold water, dry or superheated steam has the least effect upon them. BAKELITE Discs are a gas-tight fit.



BAKELITE is a successful substitute for expensive metal. Its structure is fibrous, giving strength and hardness. It can be reground and refaced, always retaining a uniform surface. It cannot be injured except by accident or friction.

Remember Bakelite Pump Valves do not warp with change of temperature.

Order your valves fitted with Bakelite Valve Discs and stop that perpetual annoyance and expense caused by leaking valves. Depend upon it, Bakelite Valve Discs will not leak.

Write for prices or ask your dealer.

Eastern Agents for Bakelite Valve Discs:

EADIE-DOUGLAS, Limited

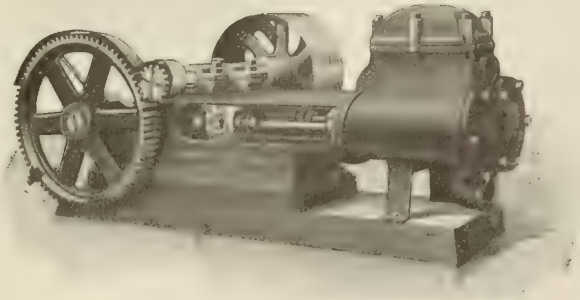
MONTREAL

PLASTICS, Limited

Van Horne St., TORONTO

We Manufacture

Steam and Power Pumps, Travelling Cranes, Etc.



WRITE FOR CATALOGUE

The Smart-Turner Machine Co.
LIMITED
HAMILTON, - - CANADA

"Philips" Tungsten Lamps

HIGHEST AWARD — International Exhibition, France, 1911.

Reinforced Lamps for Factory Use.

Quality and Low Price.

D. E. C. Carbon Lamps
refilled kind.

The same service for a lower price.

Exchange your extinct lamps for good lamps.

Save money by purchasing all your lamps from

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St. Catharines, Ont.

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Foundry Work

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Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute.

160 pp., 150 illus. Cloth binding. A practical guide to modern methods of molding and casting in iron, brass, bronze, steel and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc.

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14 TO 16 JURORS STREET, MONTREAL

Engineers and Machinists
Brass and Iron Founders
Boilermakers and Blacksmiths

Special Portable Boring Gear for Boring Engine Cylinders, Etc., In Place.

UNITED FIRE BRICK COMPANY

UNIONTOWN, PA.

HIGH GRADE FIRE BRICK, SILICA BRICK, SPECIAL SHAPES, AND DUST.

Special Brands for Foundry, Rolling Mill and Steel Plants, Cement and Lime Kilns, Glass Plants, Bee-Hive and By-Product Coke Ovens, Boiler Settings, Forge (oil or gas) Furnaces, etc.

MAIN OFFICE:
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UNIONTOWN, PA.

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PITTSBURG, PA.

Canadian Sales Agent: W. F. MARSHALL, 97 King St. West, Toronto
Long Distance Telephone Main 6054 Toronto

The Brush Carbon Lamp



The Brush Metallum Lamp

THE BRUSH METALLUM LAMP is recognized to be one of the best tungsten lamps on sale in Canada to-day. It is manufactured for our principals, who are one of the largest electrical supply houses in the British Empire, and it has always proved to their entire satisfaction.

The approximate life of this lamp is from one thousand to fifteen hundred hours, and you have the reputation of a firm like the Brush Company behind it.

The Brush Carbon Lamp is low in price and high-grade in quality.

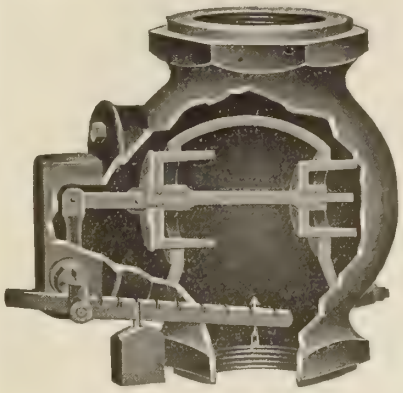
May we send you samples?

CANADA FORD COMPANY LIMITED

C. L. TRIMINGHAM
Special Representative
WINNIPEG

485 St. James Street, MONTREAL

Double Seated Noiseless Back Pressure Valve



The construction of the inner Valve and seats is of such a nature that uneven expansion of the metals will not cause the Valve to STICK or BIND—A FEATURE which places this Valve in a class by itself. ANOTHER FEATURE of our Back Pressure Valve is that it can be placed in ANY POSITION.

It is a DISTINCT improvement on the OLD STYLE single seated Valve. It has a DOUBLE PISTON TYPE of inner Valves, with disc of different area.

Guaranteed close regulation without excessive weighting. Carried in stock from 2 to 16 inches.

Darling Bros., Ltd.

127 Prince Street - Montreal, P.Q.

Toronto, Ont. Winnipeg, Man. St. John, N.B.

ENGINEERS AND BUILDERS

of all

Steel and Iron Structures

Mill Buildings Our Specialty.

Roofs, Bridges, Columns and Girders of Every Description.

Large Stock of Structural Shapes

always on hand for immediate shipment.

Ask for Designs and Estimates on Your Work.

International Marine Signal Company, Limited, Ottawa Canada

MARINE ENGINES and PUMPS. SHOE MACHINERY A Specialty



BRASS and IRON CASTINGS. BOILERS and REPAIRS.

That we have exceptional facilities at our disposal for the manufacture of all kinds of Machinery—in addition to our business as Brass and Iron Founders, General Contractors and Shoe Machinery Engineers—has been amply proved this year. In the short space of five months, we built and installed all the Engines and Boilers of the new sister steamers "Levis" and "Lauzon," whose trial trips were a complete success. We make a specialty of all kinds of Marine Engine Work, and shall be glad to quote for first-rate products only.

SHOE MACHINERY. Manufacturers of "Non-Royalty" Machines, Metallic and Goodyear, "Fortuna" Skivers, and "Climax" Presses, Sand-papering, Lasting and Loose Studding Machines.

Wire of every description for Slugger and Standard Screw Machines.

The Canadian General & Shoe Machinery Company, Ltd.

ERNEST CARON, Managing Director

LEVIS, Quebec

The advertiser would like to know where you saw his advertisement—tell him.

CHEAP AIR



The class "NE-1" compressor is the aristocrat of small compressors.

It's the small machine with the large capacity.

The machine that has the greatest number of advantages in its construction.

The bearings are exceptionally large and are flooded with oil, completely separating gearing parts from metallic contact, reducing friction and wear to the limit.

The air cylinder is designed for high efficiency and it shows remarkable efficiencies.

Automatic Regulation. ***Automatic Lubrication.***

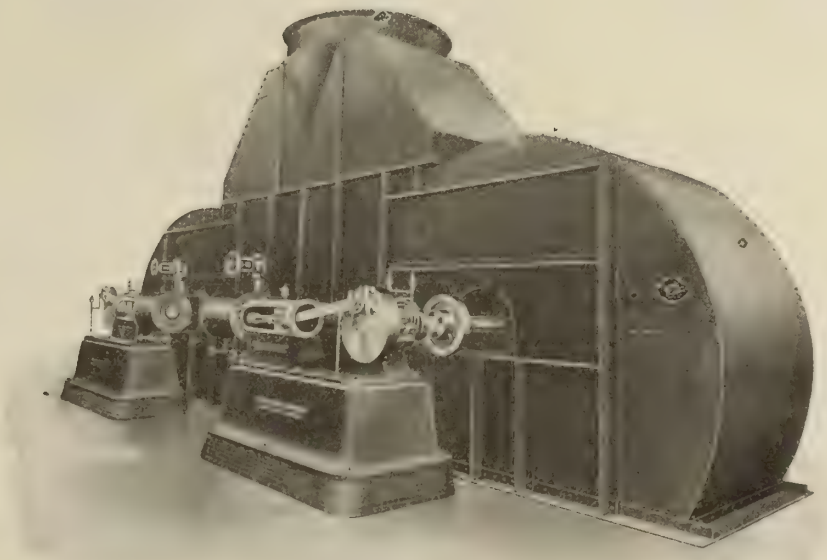


CANADIAN RAND COMPANY LIMITED

COMMERCIAL UNION BUILDING

MONTREAL, CAN.

SYDNEY MONTREAL TORONTO COBALT WINNIPEG LETHBRIDGE ROSSLAND VANCOUVER

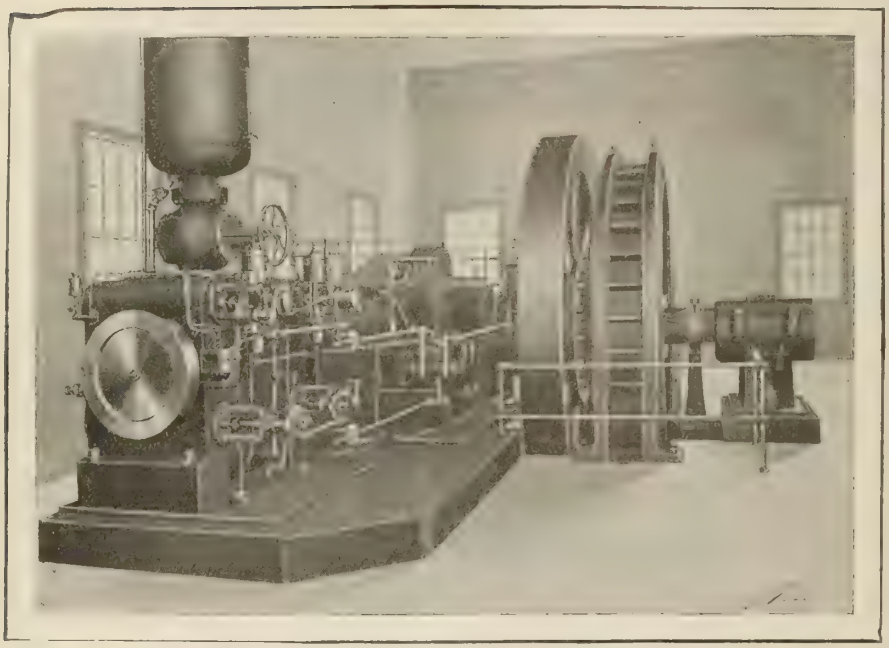


Burn Cheap Fuel

With the Sheldon Mechanical Induced Draft System you can cut the cost of fuel in half, by utilizing a cheaper grade, or can secure better and almost smokeless combustion from the same grade of fuel that you are now using.

Send for Catalogue No. 14

SHELDONS LIMITED - GALT, ONTARIO



Goldie Corliss Steam Engines

give a maximum of service all of the time at a minimum cost of upkeep.

Install Your Own Plant and Save Money

We will be pleased to supply catalogues and further information to persons interested.

Illustration shows one of 3 Heavy Duty Goldie Corliss Steam Engines, built and installed by us for the Sandwich, Windsor and Amherstburg Street Railway, at Windsor, Ontario

The Goldie & McCulloch Co., Limited

GALT, - - ONTARIO, - - CANADA.

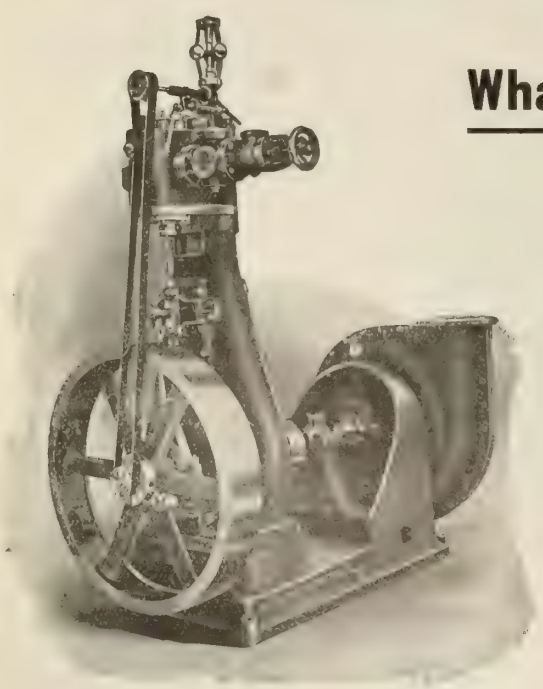
WESTERN BRANCH
248 McDermott Ave., Winnipeg, Man.

MARITIME PROVINCES
13-15 Dock St., St. John, N.B.

QUEBEC AGENTS
Ross & Greig, 412 St. James St., Montreal, Que.

B. C. SELLING AGENTS
Robt. Hamilton & Co., Vancouver, B.C.

WATEROUS CENTRIFUGAL SPLIT-BASE PUMPS



What They Will Do—and How

Waterous Pumps are designed to handle foaming, non-foaming and precipitating liquors, pulp stuff, and water—hot or cold—containing up to 20% suspended matter.

They can be adapted for circulating condenser water, pumping sewage, excavation work, sand dredging, irrigation pumping, mine drainage and handling pulp stuff.

Waterous pumps are built in sizes up to 14 in. discharge opening—in both horizontal and vertical types—and are adapted for engine, motor or belt drives.

The split-base—a Waterous feature—allows all working parts to be lifted bodily from the base without disturbing the foundation bolts.

Packing gland is split to increase accessibility. There are no restricted water passages to clog up, no valves or eccentrics to get out of order.

Write for illustrated catalogue No. 200.

The Waterous Engine Works Co., Limited

BRANTFORD, CANADA

The advertiser would like to know where you saw his advertisement—tell him.

Noon Couplers



(Copy)

Noon Universal Coupler Co., Limited, Toronto, Sept 5th, 1911.
Toronto, Ont.

Dear Sirs,—We have been using the Noon Universal Hose Coupler since April 1st, and we are pleased to state that it is the most efficient coupling we have ever used and gives perfect satisfaction.
We were the first people to use these couplers

Yours truly, TORONTO IRON WORKS, LTD.,
J. H. Malone, Superintendent.

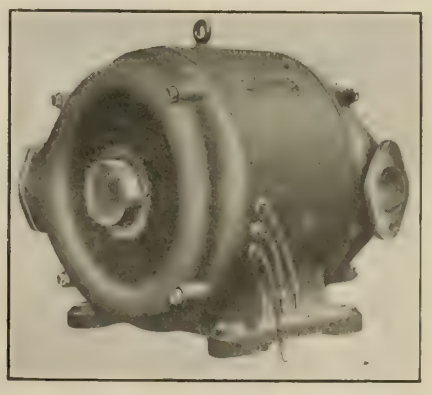
Write for our prices and literature.

THE NOON UNIVERSAL COUPLER CO.
LIMITED
Room 603, Kent Bldg., TORONTO, ONT.

The Lancashire Dynamo & Motor Co., Limited
152-4 Bay Street, Toronto

Electrical Machinery

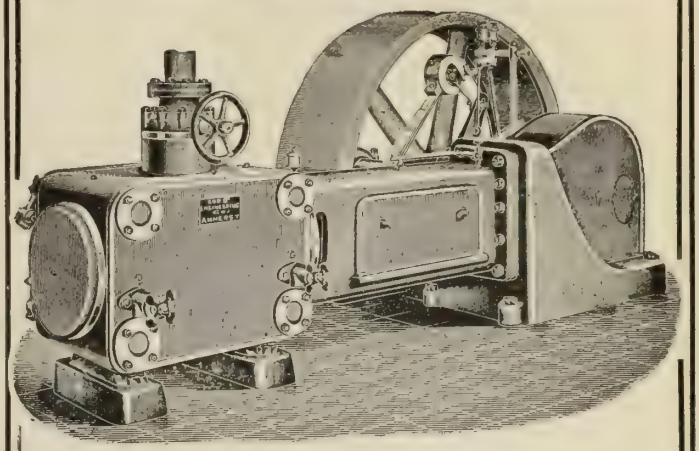
For all purposes. Delivery of Motors and Spare Parts from Canadian stock.



PIPE VENTILATED A.C. MOTOR
FOR VERY DIRTY PLACES

Robb-Armstrong CORLISS ENGINES

For Electric Plants, Factories and Mills.



Continuous service with the least possible attention is secured by the positive valve gear and moderate piston speed.

Freedom from vibration is a result of a short stroke and compact frame.

Low steam consumption as in Corliss Engines.

Close speed regulation is assured by the Robb governor controlling the cut-off directly.

Duplicates of parts always on hand for prompt shipment, for all Robb engines are made on the interchangeable system.

Robb Engineering Company, Limited

WORKS.
AMHERST, N.S., CANADA
SOUTH FRAMINGHAM, MASS.

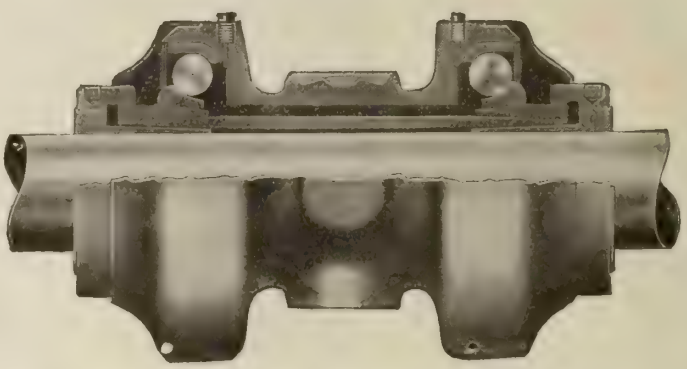
DISTRICT OFFICES:

Canadian Express Bldg., Montreal, R. W. Robb, Manager.
Traders Bank Bldg., Toronto, - William McKay, "
Union Bank Bldg., Winnipeg, - W. F. Porter, "
Grain Exchange Bldg., Calgary, - J. F. Porter, "

GENERAL AGENTS FOR CANADA FOR THE
Gas Engines and Suction Gas Producers
Made by DAVEY, PAXMAN & CO., LIMITED.
39-8

You Can Increase Your Power Without Increasing the Size of Your Power Plant

YOUR present line shafting is wasting from 15 per cent. to 60 per cent. of your power.



The Chapman Double Ball Bearings will save this waste and turn it into productive energy.

They will also reduce your oiling and attention to a minimum.

They fit any standard adjustable hanger, and the change can be made with but little delay to you.

IN USE IN OVER 1,000 CANADIAN FACTORIES.

The Chapman Double Ball Bearing Company of Canada, Ltd.

339-351 SORAUREN AVENUE, TORONTO, CANADA

PHONE PARK 2790

GREAT SAVINGS Result from the Use of

GOODHUE BELTINGS

As they stretch from 15% to 25% less than any other belting and save much money that would otherwise be wasted by paying a man to shorten the belt.

The extra care in stretching the belting before it is placed on the market and the rejection of all unstretched parts account for "GOODHUE" undoubted superiority over all other brands.

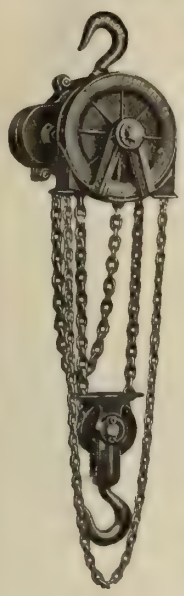
According to the conditions in which the belt has to be used we recommend our "EXTRA," "STANDARD," or "ACME," Waterproof Belts.

We invite comparison, because it is our greatest advertisement. ***Write us at once.***

J. L. Goodhue & Co., Limited

DANVILLE, P.Q.

Cyclone Hoists



are simple and efficient. All bearings are graphite bronze, self lubricating, and require no oil.

They have 80 per cent. efficiency and are of ½ to 20 tons capacity. We stock from ½ to 5 tons, but can supply greater capacity at short notice.

Matchless Trolleys

will pick up and move any load and place it just where you want it. They are adjustable to any size "I" beams.

We also carry Gravity Molding Machines, Jar and Squeeze Molding Machines, Hauck Oil Burners, Acme Parting, Red Facing.

A post card will bring you our catalogue.
Send for it to-day.

The Ontario Wind Engine & Pump Co.
LIMITED
Foundry Supply Department - - TORONTO

That Problem

of running your plant economically is an important one, and yet one that is seldom satisfactorily solved. Let us help you solve this problem.



INSTALL THE

ONEIDA

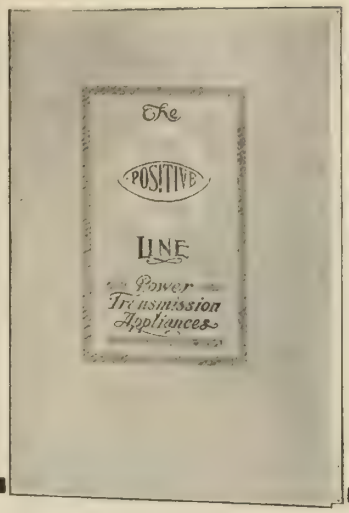
Steel Pulley

The light weight of Oneida Steel Pulleys is the means of lowering the amount of power usually lost in transmission, being ⅓ to ⅓ the weight of cast iron.

WRITE FOR CATALOGUE AND ADDRESS OF NEAREST AGENT

Oneida Steel Pulley Co.

Oneida, N.Y.



THERE'S A COPY FOR YOU

If you are interested in selling a line of power transmission appliances that has strong talking points, that has distinctive merit, that has unique individuality, that appeals to manufacturers because it embodies the perfection of modern principles of power distribution and control; or if you are a manufacturer and contemplate using any new power transmission equipment, you want this catalogue, "The POSITIVE Line."

You can't afford not to investigate POSITIVE Combined Jaw and Friction Clutches, Combination Split Pulleys, Shaft Hangers, Pillow Blocks, Compression Shaft Couplings, etc., if you want to handle or use the line that is so entirely different, better and far in advance of existing designs of such appliances, that it has revolutionized the transmission of power in manufacturing plants and has established a higher standard of dependability, durability, economy and efficiency in industrial operations.

The catalogue also contains some handy engineering tables and formulae. When you ask for it, don't fail to state, "Second edition of The POSITIVE Line."

The Positive Clutch & Pulley Works
Limited
TORONTO - ONT.

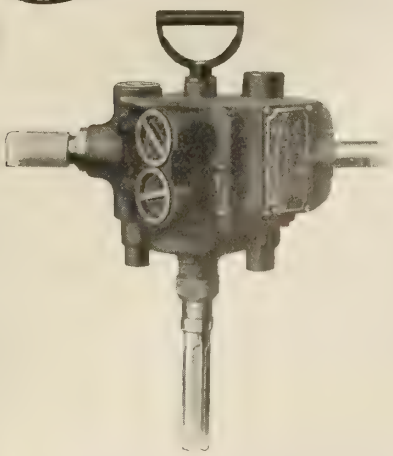
American Works:
Buffalo, N. Y.

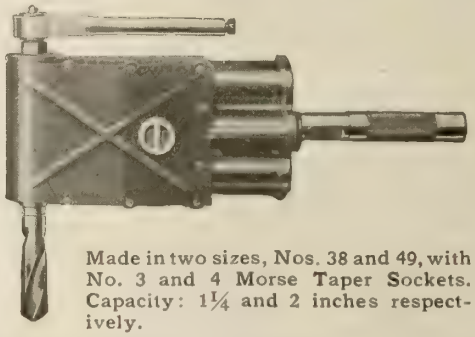
Montreal
Representatives:
Canada Ford Co., Limited

Cleveland AIR TOOLS

Cleveland Corner Drill

FOR CLOSE QUARTER DRILLING





Made in two sizes, Nos. 38 and 49, with No. 3 and 4 Morse Taper Sockets. Capacity: 1¼ and 2 inches respectively.

¶ Adapted to Drilling and Reaming in narrow places where the Center Spindle Drill cannot be used.

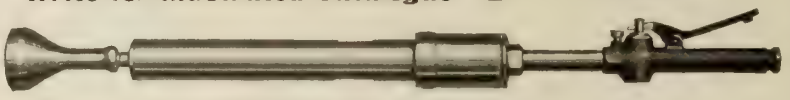
¶ Can drill or ream within 1⅛ inches of side wall or corner.



Riveting Hammers and Chipping Hammers are made in sizes to suit all classes of work and are fitted with either outside or inside latch as preferred.

Cleveland Four-Piston Air Drills are made in sizes to suit all classes of work and furnished reversible or non-reversible as required.

Write for Illustrated Catalogue "L"



DUST PROOF

Clevleand Sand Rammers for Floor, Flask and Bench Ramming. Made in sizes adapted to general Foundry and Steel Castings Work

The Cleveland Pneumatic Tool Co.

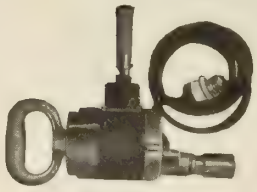
NEW YORK General Offices and Works, Cleveland, Ohio, U.S.A. CHICAGO

A. R. Williams Machinery Co., TORONTO, WINNIPEG, VANCOUVER and ST. JOHN'S

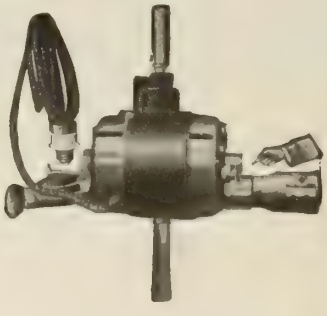
Williams and Wilson, MONTREAL

U. S. Electric Drills and Grinders

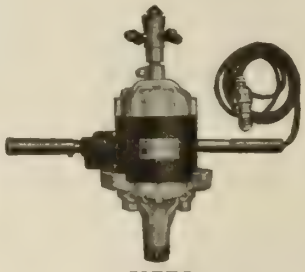
Are saving time and labor in every shop they are in---for drilling in metal they are superior to any kind of portable drill, cost 50% less to run than air drills. Attach to any lamp socket to operate.



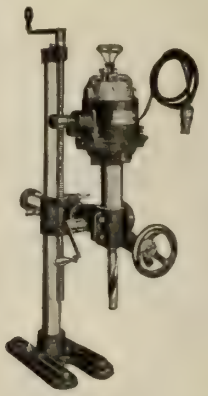
3-SIZES
3/16 inch, W.G.T. 6 lbs.
¼ inch, W.G.T. 9 lbs.
⅜ inch, W.G.T. 12 lbs.



½ inch---2 SPEED
Speed, 400-750 R.P.M.



4-SIZES
¾ - 1 - 1¼ and 1½ inch.



Portable Radial Drill
Full Universal
2-sizes, 7/8 and 1¼ inch.

All motors wound for 110 or 220 volts. Direct or alternating current.

Write for Catalogue.

For sale by **THE CANADIAN FAIRBANKS CO., LTD.**

Montreal - St. John, N.B. - Toronto - Winnipeg - Calgary - Vancouver

The United States Electrical Tool Co.

CINCINNATI, - - - - - - OHIO, U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

We Believe There Is No Wrench Made Just As Good As A

TRIMO WRENCH

If you don't think so, ask your successful competitor why he uses Trimo Tools. We spare neither time, money, nor brains in their construction. They cannot be given away. They cost too much. But they are a real friend in a tight corner. Try them and be convinced.

SEND FOR CATALOGUE NO. 200.



TRIMO PIPE WRENCH



TRIMO MONKEY WRENCH

MADE BY

THE TRIMONT MFG. CO.

55-71 AMORY STREET - - ROXBURY, MASS.
(BOSTON)

ARMSTRONG

DROP FORGED STEEL LATHE DOGS



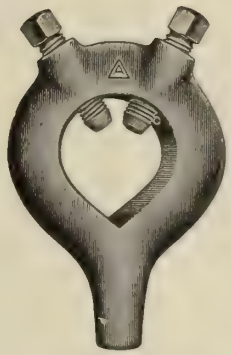
All Kinds
All Sizes
3-8 in. to 8 in.

POINTS OF EXCELLENCE

Uniformity of design.

Tool steel set screws with our improved beveled point which prevents upsetting.

No draft left on the inside, thus insuring a good true bearing and a bite that won't slip.



HEAVY DUTY DOG

Write for Special Circular and Discounts.

Have Armstrong Quality

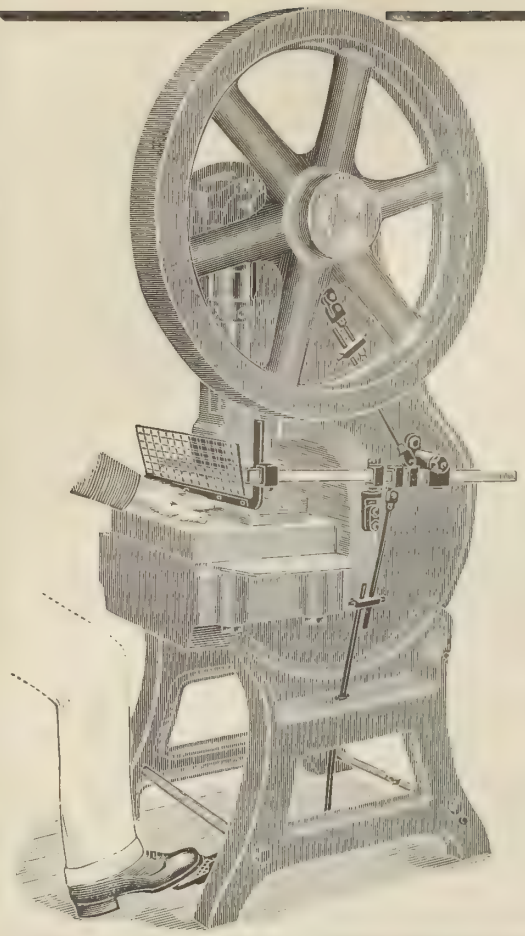
Best Obtainable in Design, Workmanship and Material

If you Want the BEST Specify ARMSTRONG Drop Forged Dogs



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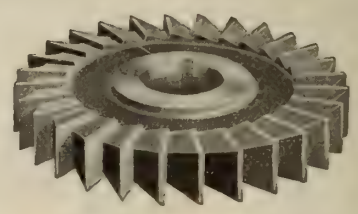
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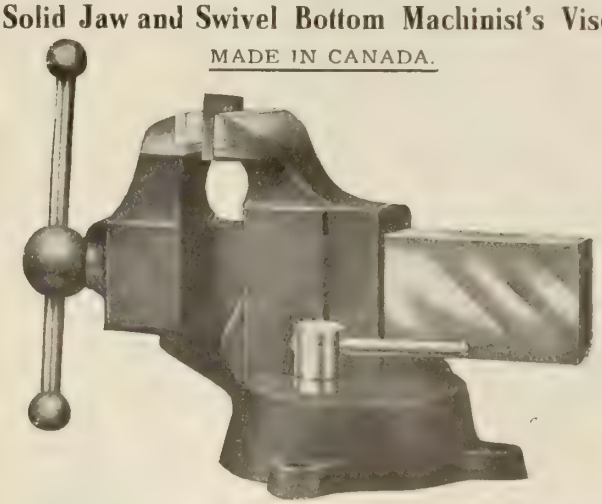
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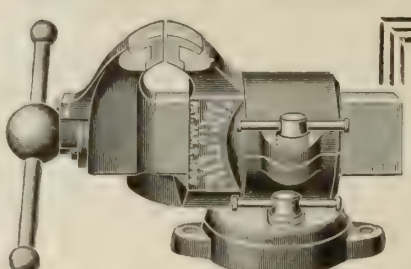
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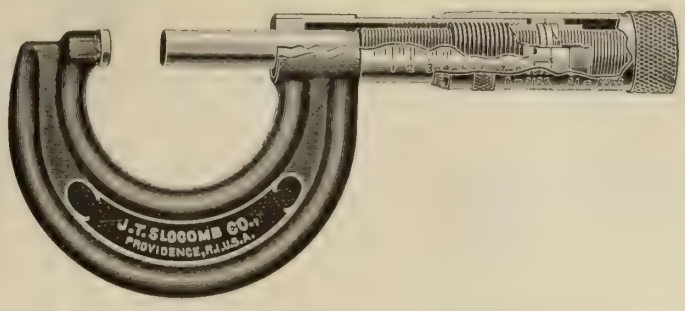
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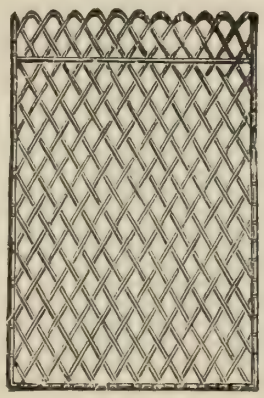
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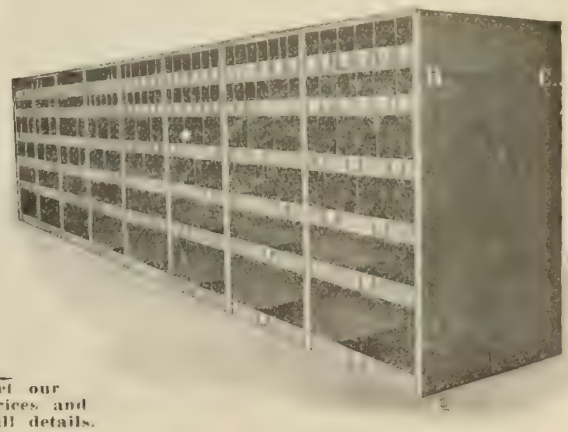
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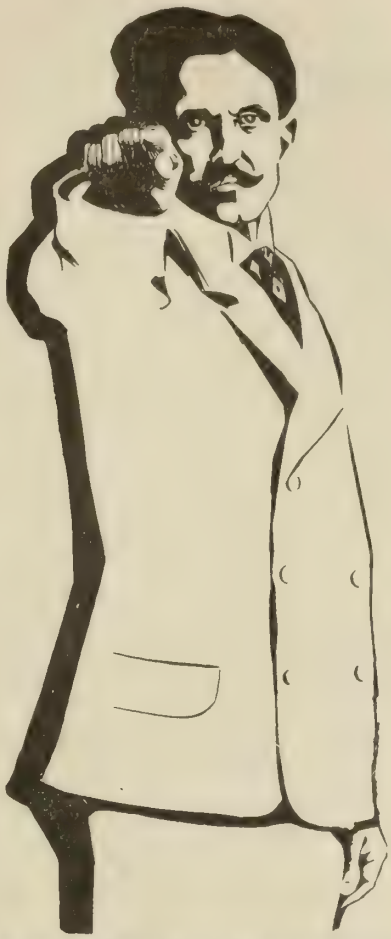
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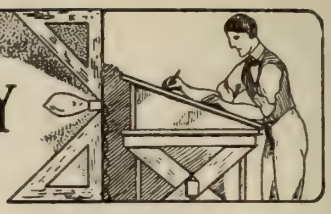
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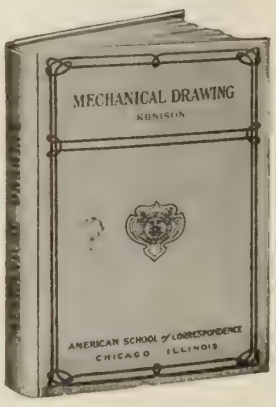
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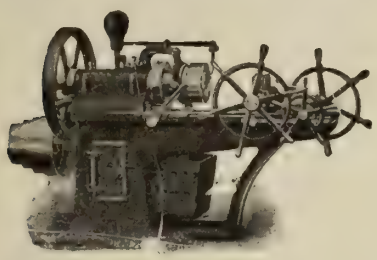
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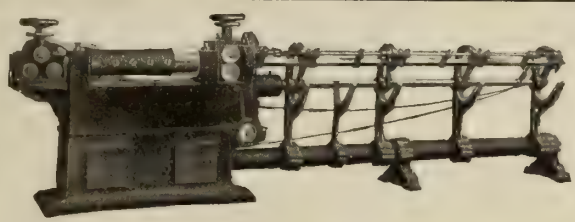
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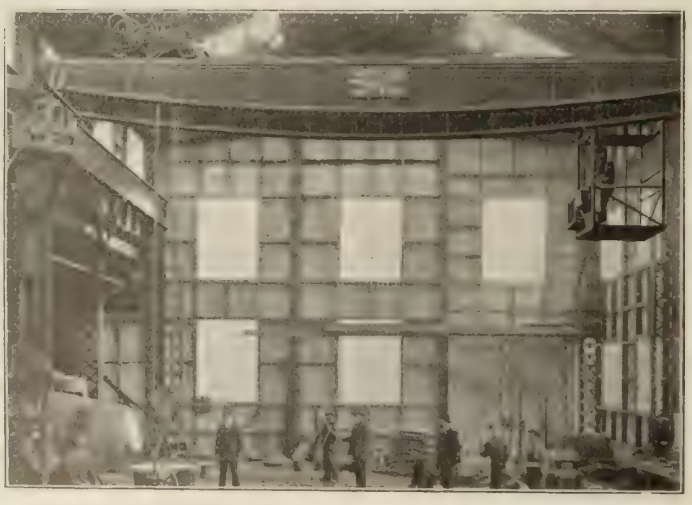
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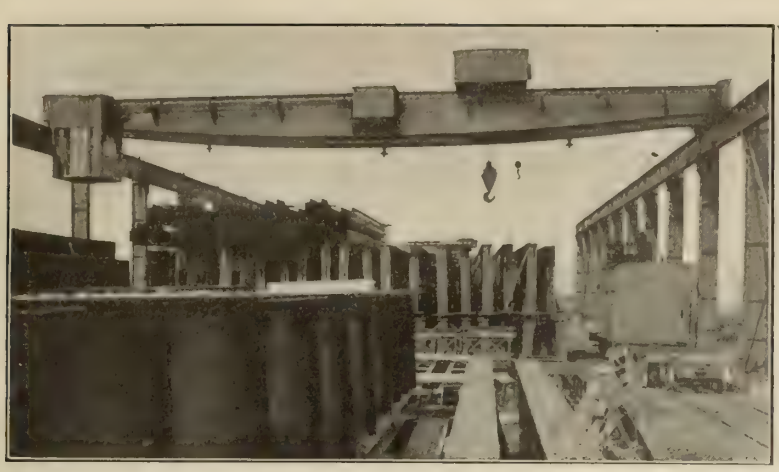
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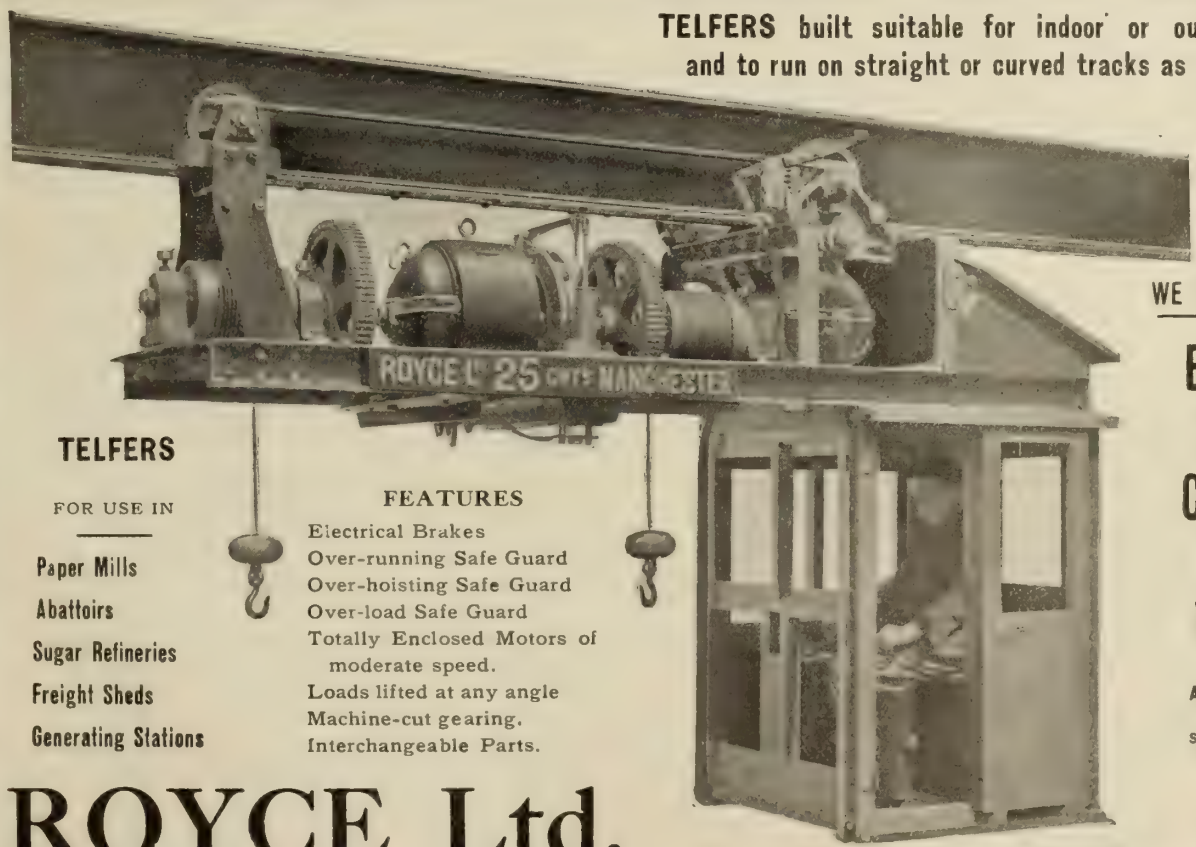
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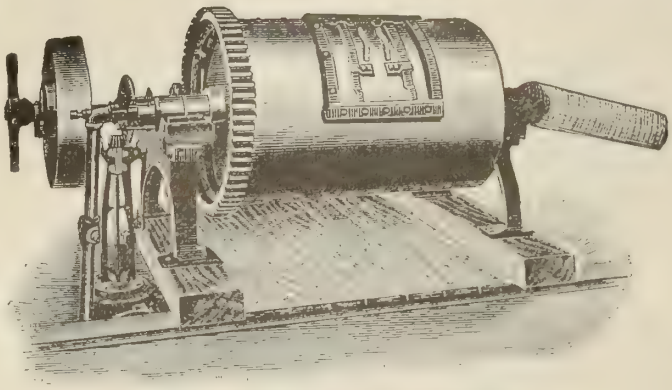
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SLY'S PATENT IRON CINDER MILL

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We guarantee Greater Efficiency than any other Electric Welder on the market.

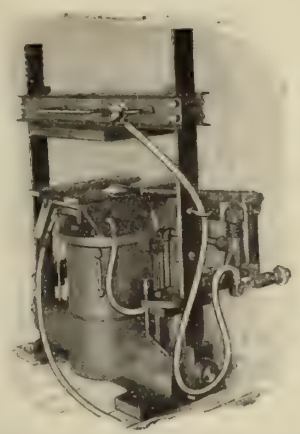
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The same machines used for welding the heavier materials can also be used for the lighter or thinner metals.

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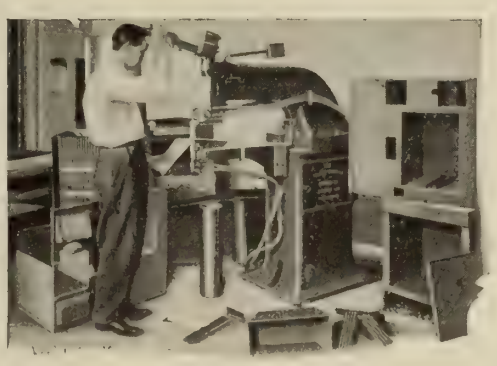
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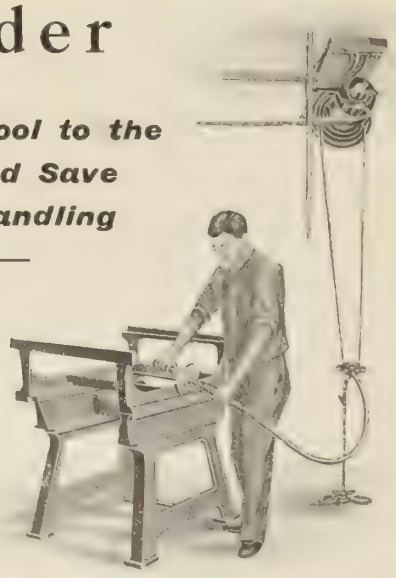
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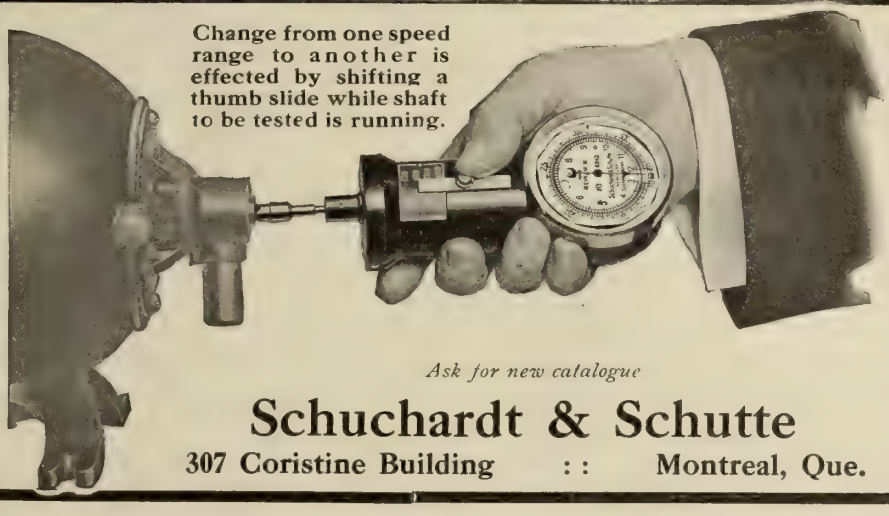
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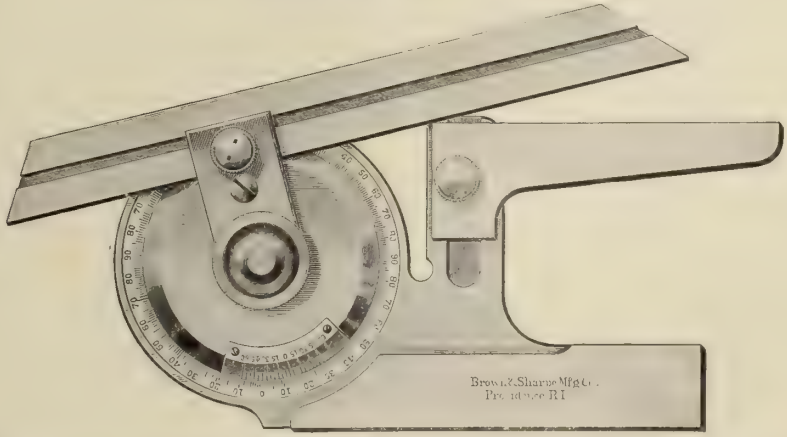
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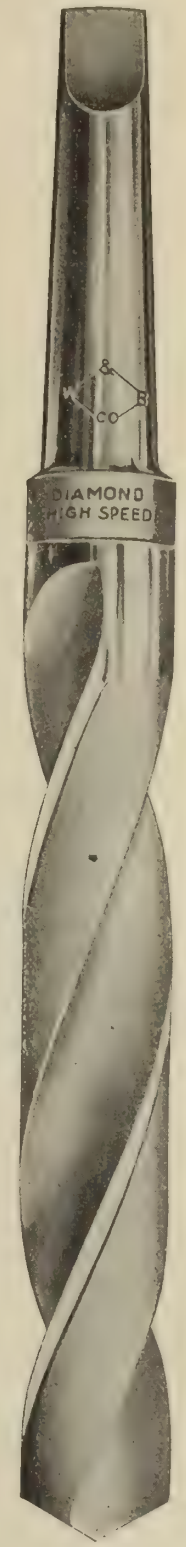
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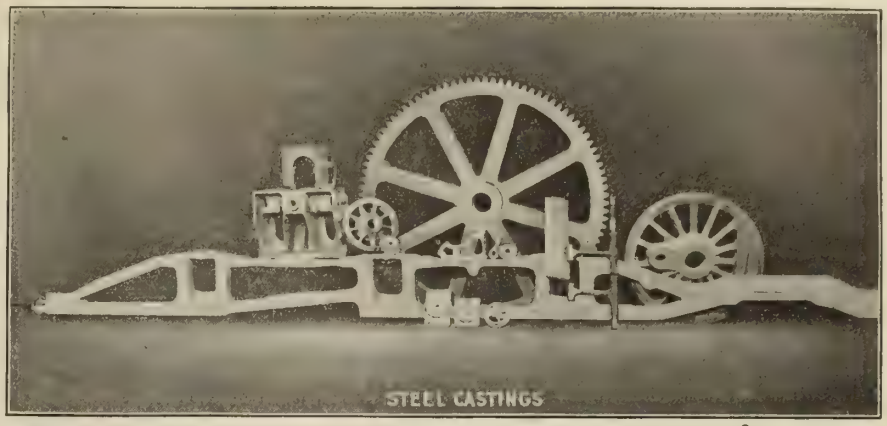
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Garvin Machine Co., New York
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Holden-Morgan Co., Ltd., Toronto
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D. McKenzie, Guelph
National Mach. & Supply Co , Hamilton
Russell Machine Co , St Catharines, Ont
F. B. Shuster Co , New Haven, Conn
Waterous Engine Co., Brantford.

Spike Machines.
The Smart-Turner Machine Co., Hamilton

Spring Coilers.
Garvin Machine Co , New York

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Cleveland Wire Spring Co., Cleveland

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Darling Bros., Ltd., Montreal.
Robb Engineering Co., Amherst N.S.
Sheldon's Limited, Galt.
The Smart-Turner Machine Co., Hamilton
Standard Engineering Co., Toronto
Waterous Engine Co., Brantford.

Steel, Nickel Chrome.
Schuchardt & Schutte, Montreal

Steel Pressure Blowers.
The Canadian Fairbanks Co., Montreal.
Francis Hyde & Co., Montreal.
Sheldon's Limited, Galt.

Steel, High Speed.
Edgar Allen & Co. Montreal
Hermann Boker & Co., Montreal
Canadian Steel Foundries, Montreal
Thos. Firth & Sons, Montreal
Canadian Fairbanks Co., Montreal.
Alex. Gibb, Montreal.
Jessop, Wm., & Sons, Sheffield, Eng.
Mussens Limited. Montreal
National Mach. & Supply Co , Hamilton

Steel Tubing, Seamless.
John Millen & Son, Montreal
Standard Welding Co., Cleveland, O

Stocks, Pipe.
Butterfield & Co., Rock Island, Que.

Stokers, Mechanical.
Standard Engineering Co., Toronto

Straightening Machinery.
Bertrams Limited, Edinburgh, Scotland
Mussens, Limited, Montreal
National Mach. & Supply Co . Hamilton
Springfield, Machine Tool Co., Springfield O

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Canadian Westinghouse Co., Hamilton
Hall Engineering Works, Montreal, Que
Toronto and Hamilton Electric Co., Hamilton.

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National Mach. & Supply Co., Hamilton

Tanks, Steel.
Goldie & McCulloch Co., Galt, Ont
International Marine Signal Co , Ottawa

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Lufkin Rule Co., Saginaw Mich.

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Cleveland Pneumatic Tool Co , Cleveland

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Garvin Machine Co., New York
General Supply Co. of Canada, Ottawa
The Geometric Tool Co., New Haven
A. B. Jardine & Co . Hespeler.
London Mach Tool Co., Hamilton, Ont
Mussens, Limited, Montreal
Niles-Rement-Pond Co., New York.
L. S. Starrett Co., Athol, Mass.

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Geometric Tool Co, New Haven. Conn.

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General Supply Co. of Canada, Ottawa
Hollands Mfg Co , Erie, Pa
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Morse Twist Drill and Machine Co., New Bedford
Mussens Limited Montreal
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O
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Toronto Testing Laboratory, Toronto

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Garvin Machine Co., New York
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Armstrong Bros. Tool Co., Chicago

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Canadian Fairbanks Co..Montreal
Thos. Firth & Sons, Montreal
General Supply Co of Canada, Ottawa
Alexander Gibb, Montreal.
Wm. Jessop, Sons & Co., Toronto
Mussens, Limited, Montreal
National Mach & Supply Co., Hamilton

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Can. Buffalo Forge Co., Montreal

Tools, Electrical.
Mussens, Limited, Montreal
United States Electric Tool Co., Cincinnati.

Tools, Lathe, Planer and Slotter.
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Detroit Foundry Supply Co , Windsor
Gem Mfg Co , Pittsburg, Pa
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General Supply Co of Canada, Ottawa
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Hamilton Gear & Machine Co , Toronto
Jones & Glassco Montreal
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Mussens Limited Montreal
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Waterous Engine Co., Brantford.

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Canadian Westinghouse Co , Hamilton

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Canadian Billings & Spencer, Ltd , Welland.
Canadian Steel Foundries, Montreal

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Springfield Machine Tool Co , Springfield, O

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Dart Union Co Ltd , Toronto

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Cleveland Pneumatic Tool Co.,Cleveland

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Sheldon's Limited, Galt
Standard Engineering Co , Toronto
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Ventilating Apparatus. ... .
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Darling Bros Ltd . Montreal
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Hollands Mfg Co , Erie, Pa
Chas Parker & Co , Meriden Conn
National Mach & Supply Co., Hamilton
Prentiss Vise Co., New York

Vises, Pipe.
Chas. Parker & Co., Meriden, Conn
Hollands Mfg. Co., Erie, Pa
National Mach. & Supply Co . Hamilton
Prentiss Vise Co. New York

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Hollands Mfg. Co . Erie, Pa
National Mach. & Supply Co , Hamilton
Niles-Bement-Pond Co., New York.

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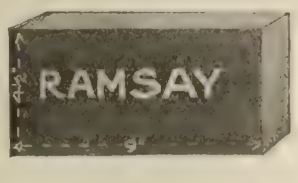
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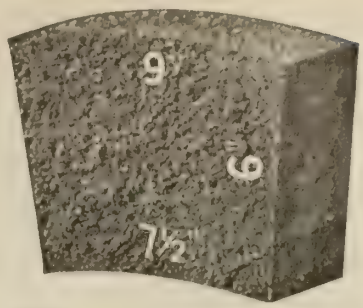


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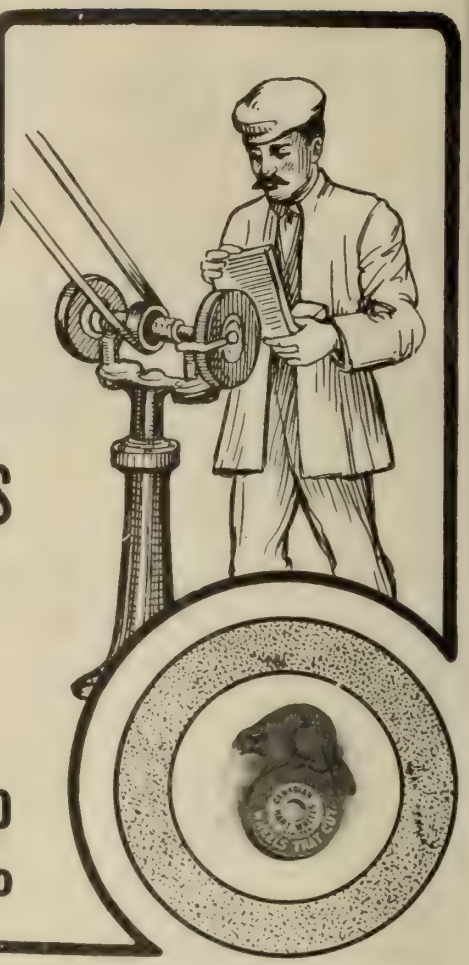
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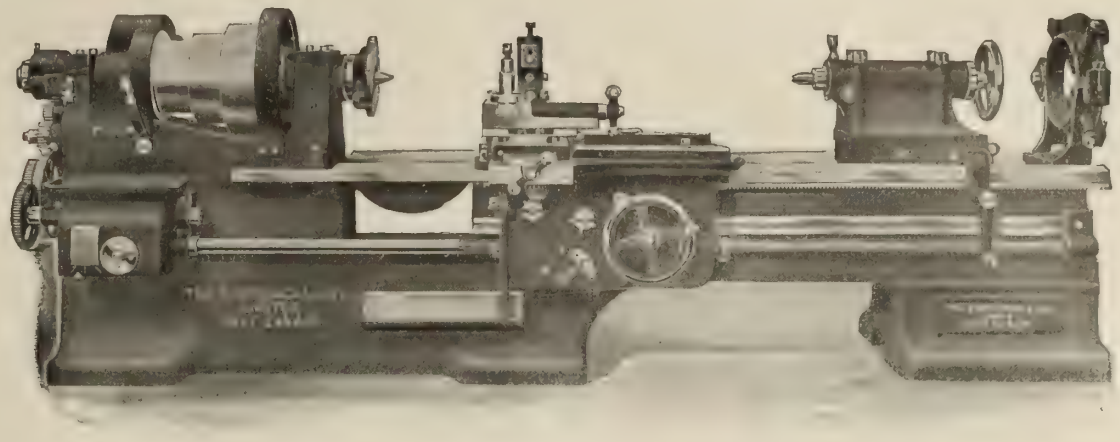
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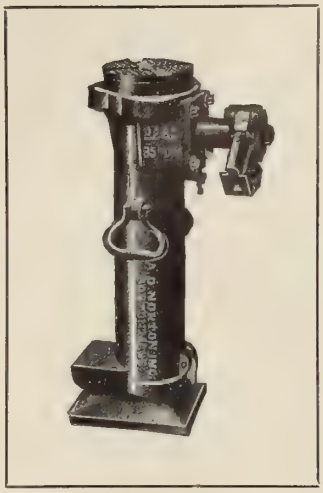
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AND MANUFACTURING NEWS

VOLUME VII

JANUARY TO DECEMBER, 1911

THE MACLEAN PUBLISHING CO., LIMITED

MONTREAL, TORONTO, WINNIPEG, LONDON, ENG.
NEW YORK, CHICAGO

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